

Isolette® Infant Incubator Service Manual

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Revisions

NOTES:

Table of Contents

Chapter 1: Introduction

Purpose	1 - 3
Audience	1 - 3
Organization	1 - 3
Chapter 1: Introduction	1 - 3
Chapter 2: Troubleshooting Procedures	1 - 3
Chapter 3: Theory of Operation	1 - 3
Chapter 4: Removal, Replacement, and Adjustment Procedures	1 - 3
Chapter 5: Parts List	1 - 4
Chapter 6: General Procedures	1 - 4
Chapter 7: Accessories	1 - 4
Typographical Conventions	1 - 5
Technical Definitions	1 - 7
Introduction	1 - 9
Overview	1 - 9
Operating Precautions	1 - 10
Features	1 - 10
Oval Access Doors	1 - 10
Mattress Tilt Mechanism	1 - 10
Pedestal Stand Assembly	1 - 10
Oxygen Control System (Optional)	1 - 10
Humidity System (Optional)	1 - 10
Weighing Platform (Optional)	1 - 10
Specifications	1 - 11
Physical Description	1 - 11
Electrical Description	1 - 13
Oxygen Control Description	1 - 14

Table of Contents

Humidity Description	1 - 14
Scale Description	1 - 15
Regulations, Standards, and Codes	1 - 15
Model Identification and Series Changes	1 - 16
Safety Tips	1 - 18
Warning and Caution Labels	1 - 24
Chapter 2: Troubleshooting Procedures	
Getting Started	2 - 5
Initial Actions	2 - 5
Function Checks	2 - 6
Final Actions	2 - 22
Alarms	2 - 23
High and Low Air and Skin Temperature Alarms	2 - 23
Alarm and System Prompt Messages	2 - 24
System Failure Messages	2 - 31
Diagnostic Menus	2 - 33
Entering the System Configuration Menu	2 - 33
Entering the Diagnostic Information Menu	2 - 35
System Test Menu	2 - 38
System Test (1 of 3) Menu	2 - 38
System Test (2 of 3) Menu	2 - 40
System Test (3 of 3) Menu	2 - 41
Key Check Display	2 - 43
Data Summary Menu	2 - 44
Data Summary (1 of 2) Menu	2 - 44
Data Summary (2 of 2) Menu	2 - 46
There Is No Power, and Power Failure Alarm Does Not Activate	2 - 49
Variable Height Adjustable (VHA) Pedestal/Stand Does Not Move Up or Down	2 - 50
Skin Set Temperature Cannot Be Achieved or Maintained	2 - 52
Oxygen Concentration is Low	2 - 54

Oxygen Concentration is High	2 - 56
Hood Does Not Tilt or Close Properly	2 - 58
Controller Failure #1—EEPROM Circuitry Failure.	2 - 61
Controller Failure #2—Ambient Air Probe Failure	2 - 62
Controller Failure #4—Controller Cooling Fan Failure.	2 - 63
Controller Failure #5—Display Test Failure	2 - 64
Controller Failure #7—Power Supply Voltage Failure	2 - 65
Controller Failure #8—RAM Test Failure	2 - 66
Controller Failure #9—Real-Time Clock Failure.	2 - 67
Controller Failure #10—Watchdog Timer Failure.	2 - 68
Controller Failure #11—Relay Test Failure	2 - 69
Controller Failure #13—Heater Circuit Failure Detected	2 - 70
Controller Failure #14—Low Heater Current Detected	2 - 71
Heater Thermocouple Does Not Work Properly	2 - 72
Humidity Heater Draws Too Much Current.	2 - 74
Motor Fails	2 - 75
Communication Between the Sensor Module and the Controller Fails	2 - 76
Sensor Module Is Out of Position.	2 - 78
A Stuck Key Is Detected.	2 - 79
Unit Fails the Non-Volatile Memory (NVM) Integrity Test	2 - 80
Access Panel Assembly Does Not Latch Properly	2 - 81
Iris Entry Port Does Not Open or Close Properly	2 - 83
Access Door Does Not Operate or Latch Properly.	2 - 84
Heat Shield Does Not Latch Properly.	2 - 86
Mattress Tray Does Not Tilt Properly	2 - 88
Mattress Tray Is Damaged	2 - 90
Air Intake Is Not Working Properly	2 - 92
X-ray Tray Does Not Operate Properly	2 - 94
Sensor Module Lock Does Not Secure the Sensor Module (Units Equipped With the Sensor Module Lock Only)	2 - 96

Table of Contents

Incubator Takes Longer Than One Hour to Warm Up to the Air Set Temperature	2 - 97
Air Set Temperature Cannot Be Maintained	2 - 99
Low Air Temperature Alarm or High Air Temperature Alarm Does Not Sound When Air Temperature Drops or Rises Out of Specification.	2 - 100
Low Skin Temperature Alarm or High Skin Temperature Alarm Does Not Sound When Skin Temperature Drops or Rises Out of Specification.	2 - 101
When Skin Probes are Disconnected, Connect Skin 1 Probe Alarm Does Not Sound	2 - 102
Incubator's Air Temperature Exceeds Air Set Temperature by 1.5°C or Greater, or Infant's Skin Temperature Exceeds Skin Set Temperature by 1.0°C or Greater	2 - 103
Humidity System Is Not Working Properly	2 - 104
Power Failure Alarm Sounds	2 - 106
Skin 1 Probe Does Not Work Properly.	2 - 107
Oxygen System Is Not Working Properly (Units Equipped With an Oxygen System Only)	2 - 110
Poor Air Circulation Exists Within the Incubator	2 - 111
Sensor Module Assembly Fails	2 - 112
Remove Skin 2 Probe Alarm Sounds	2 - 113
Scale Is Not Working Properly.	2 - 114
Oxygen System's Cal Fail System Prompt Message Appears	2 - 117
Controller Failure #15—Invalid Parameter in NVRAM	2 - 118
Controller Failure #16—NVRAM Integrity Failure.	2 - 119
Controller Failure #17—Non-volatile RAM Parameter Consistency Check Failure.	2 - 120
Chapter 3: Theory of Operation	
Controller Assembly.	3 - 3
Variable Height Adjustable Pedestal/Stand Assembly.	3 - 7
Hood/Shell Assembly	3 - 8
Theory of Operation	3 - 17
Electrical System	3 - 17
Sensor Module	3 - 17

Controller	3 - 21
Impeller Movement Detector (IMD) P.C. Board	3 - 22
Fan Motor	3 - 23
Heater Power.....	3 - 24
Humidity Heater Power	3 - 24
Air System	3 - 28
Overall Functional Description.....	3 - 28
Air Mode.....	3 - 30
Skin Mode.....	3 - 31
Oxygen Control.....	3 - 31
Humidity Control Valve	3 - 32
Hardware.....	3 - 32
Weighing Mode	3 - 32
Trend Displays	3 - 32
Interface Connections.....	3 - 33
RS-232 Serial Port Protocol	3 - 34

Chapter 4: Removal, Replacement, and Adjustment Procedures

Skin Temperature Probe	4 - 5
Removal	4 - 5
Replacement	4 - 5
Sensor Module Assembly.....	4 - 6
Removal	4 - 6
Replacement	4 - 7
Oxygen Sensor Cell	4 - 8
Removal	4 - 8
Replacement	4 - 9
Controller Assembly.....	4 - 10
Removal	4 - 10
Replacement	4 - 10
Hood Assembly.....	4 - 12
Removal	4 - 12

Table of Contents

Replacement	4 - 12
Check Valve Assembly	4 - 14
Removal	4 - 14
Replacement	4 - 16
Mattress, Mattress Tray, and X-ray Tray	4 - 17
Removal	4 - 17
Replacement	4 - 18
Impeller Assembly	4 - 19
Removal	4 - 19
Replacement	4 - 20
Motor Assembly	4 - 21
Removal	4 - 21
Replacement	4 - 24
Access Panel	4 - 26
Removal	4 - 26
Replacement	4 - 28
Adjustment	4 - 29
Iris Entry Port Sleeve	4 - 30
Removal	4 - 30
Replacement	4 - 30
Access Door Latch	4 - 32
Removal	4 - 32
Replacement	4 - 34
Access Door and Access Door Pivot Hinges	4 - 35
Removal	4 - 35
Replacement	4 - 36
Electroluminescent (EL) Display Front Panel	4 - 38
Removal	4 - 38
Replacement	4 - 39
Electroluminescent (EL) Central Processing Unit (CPU) P.C. Board, EL Display Faceplate, and EL Display	4 - 40

Removal	4 - 40
Replacement	4 - 41
Controller Fan Assembly	4 - 42
Removal	4 - 42
Replacement	4 - 43
Interface/Power Supply Module	4 - 44
Removal	4 - 44
Replacement	4 - 45
Power Supply P.C. Board Assembly and Interface P.C. Board Assembly	4 - 46
Removal	4 - 46
Replacement	4 - 47
Air Intake Microfilter	4 - 48
Removal	4 - 48
Replacement	4 - 48
Heater Assembly	4 - 49
Removal	4 - 49
Replacement	4 - 51
Impeller Movement Detection Sensor	4 - 52
Removal	4 - 52
Replacement	4 - 54
AC Wiring Harness Assembly	4 - 55
Removal	4 - 55
Replacement	4 - 57
Sensor Module-To-Controller Cable Assembly	4 - 59
Removal	4 - 59
Replacement	4 - 61
Access Panel Pawl Latch and Knob Assembly	4 - 63
Removal	4 - 63
Replacement	4 - 64
Iris Entry Port Retaining Rings	4 - 66
Removal	4 - 66

Table of Contents

Replacement	4 - 66
Access Door Cuff	4 - 67
Removal	4 - 67
Replacement	4 - 67
Access Door Gasket	4 - 69
Removal	4 - 69
Replacement	4 - 69
Pivot/Hook Lock Assembly Bracket	4 - 70
Removal	4 - 70
Replacement	4 - 71
Heat Shield Latch	4 - 73
Removal	4 - 73
Replacement	4 - 74
Heat Shield	4 - 75
Removal	4 - 75
Replacement	4 - 76
Mattress Tilt Knob	4 - 77
Removal	4 - 77
Replacement	4 - 80
Mattress Tilt Mechanism	4 - 83
Removal	4 - 83
Replacement	4 - 86
Sensor Module Lock (Models with Sensor Module Lock Only)	4 - 87
Removal	4 - 87
Replacement	4 - 88
Access Grommet	4 - 89
Removal	4 - 89
Replacement	4 - 90
Upper Transition Plate	4 - 91
Removal	4 - 91
Replacement	4 - 91

Chapter 5: Parts List

Service Parts Ordering	5 - 7
Recommended Spare Parts	5 - 10
Incubator Hood and Shell Assembly	5 - 12
High Dual Access Hood Assembly with Left & Right Iris Ports (P/N 83 200 77-R)	5 - 16
High Front Access Hood Assembly with Two Access Doors and Left & Right Iris Ports (P/N 83 200 71-R) (Series 00 Model)	5 - 20
High Front Access Hood Assembly with Two Access Doors and Left & Right Iris Ports (P/N 83 200 78) (Series 01 Model)	5 - 24
High Dual Access Hood Assembly with One Access Door and One Iris Port (Series 00 Model)	5 - 28
High Dual Access Hood Assembly with Left Iris Port and Right Access Door (P/N 83 200 79) (Series 01 Model Only)	5 - 32
High Dual Access Hood Assembly with Left & Right Access Doors (P/N 83 200 73) (Series 00 Model Only)	5 - 36
High Dual Access Hood Assembly with Left & Right Access Doors (P/N 83 200 80-R) (Series 01 Model Only)	5 - 40
High Front Access Hood Assembly with Left & Right Access Doors (P/N 83 200 74) (Series 00 Model Only)	5 - 44
High Front Access Hood Assembly with Left & Right Access Doors (P/N 83 200 81) (Series 01 Model Only)	5 - 48
High Front Access Panel Assembly (P/N 83 300 70-R) (Series 00 Model Only)	5 - 52
Replacement High Front Access Panel Assembly (P/N 83 300 76-R) (Series 01 Model Only)	5 - 56
High Rear Access Panel Assembly (P/N 83 300 71-R) (Series 00 Model Only)	5 - 60
Replacement High Rear Access Panel Assembly (P/N 83 300 77-R) (Series 01 Model Only)	5 - 64
Shell Assembly (Series 00, 01, and 02 Models Only)	5 - 68
Top Shell Assembly and Barn Door Shell Assembly (Series 00, 01, and 02 Model Only)	5 - 72
Shell Assembly (Series 03 Model Only)	5 - 76
Top Shell Assembly (Series 03 Model Only)	5 - 80

Table of Contents

Impeller Movement Detector P.C. Board Assembly	5 - 83
Controller Assembly—Model C2C-2 (P/N 83 006 76)	5 - 84
Controller Enclosure Assembly	5 - 86
Electroluminescent Display Front Panel Assembly	5 - 88
Interface/Power Supply Module	5 - 89
Sensor Module Assembly	5 - 90
Fixed-Height Pedestal Stand Assembly (Series 00 Model Only).	5 - 92
Fixed-Height Pedestal Stand Assembly (Series 01 and Higher Models Only).	5 - 96
Variable Height Adjustable Pedestal Stand Assembly.	5 - 100
Hood/Shell Assembly and Pedestal Stand Assembly Attachment	5 - 104
Front and Rear Foot Switch Assemblies.	5 - 106
Check Valve Assembly Replacement Kit (P/N 83 900 16)	5 - 108
Scale Assembly (P/N 83 600 50)	5 - 110
IV Pole Assembly (P/N 83 444 00) (Accessory)	5 - 112
High Monitor Shelf Assembly (P/N 83 442 00) (Accessory).	5 - 114
Swivel Drawer Assembly, Small (P/N 83 441 00) and Large (P/N 83 440 00) (Accessory)	5 - 116
Humidity System Assembly (P/N 83 610 70/80/90) (Accessory)	5 - 120
Humidity System Assembly (P/N 83 613 70/80/81/90) (Accessory) (Series 02 Model Only).	5 - 124
Evaporator Reservoir Assembly (Accessory) (Series 02 Model Only)	5 - 126
Oxygen System Assembly (P/N 83 620 60 and 83 621 20/21/22) (Accessory).	5 - 130
Ventilator Tube Support (P/N 83 001 05) (Accessory)	5 - 133
Oxygen Tank Bracket Assembly (P/N 83 443 00) (Accessory).	5 - 134
Chapter 6: General Procedures	
Cleaning	6 - 3
Steam Cleaning	6 - 4
Cleaning Hard to Clean Spots.	6 - 4
Disinfecting.	6 - 4
Using Cleaning Agents.	6 - 4

Skin Temperature Probe	6 - 4
Access Door Gaskets and Tubing Access Ports	6 - 4
Controller, Shell, and Pedestal Stand	6 - 5
Hood, Sensor Module, and Heat Shields	6 - 5
Heater Radiator and Fan Impeller.	6 - 6
Mattress Tray, Main Deck, Heater/Impeller Cover, and Mattress Tilt Bars	6 - 7
Air Intake Microfilter	6 - 7
Humidity Reservoir.	6 - 7
Component Handling	6 - 8
P.C. Board.	6 - 8
Lubrication Requirements.	6 - 9
Preventive Maintenance	6 - 10
Preventive Maintenance Schedule	6 - 11
Preventive Maintenance Checklist	6 - 12
Installation and Set-up	6 - 13
Unpacking	6 - 13
Assembling	6 - 13
Setting Up	6 - 15
Oxygen Sensor Calibration	6 - 19
Room Air—21% Oxygen Calibration	6 - 19
100% Oxygen Calibration	6 - 20
Oxygen Concentration Test	6 - 22
Weighing Scale Calibration	6 - 24
Current Leakage Test	6 - 26
Set-Up	6 - 26
Procedure	6 - 26
Disassembly and Assembly for Cleaning	6 - 27
Disassembly	6 - 27
Cleaning	6 - 31
Assembly	6 - 31

Table of Contents

Filling the Humidity Reservoir	6 - 33
Updating the Software	6 - 34
Procedure	6 - 34
Installing the VueLink™ Software Monitor Connection	6 - 36
Tool and Supply Requirements.	6 - 37
Chapter 7: Accessories	
Accessories	7 - 3
Weighing Scale	7 - 5
Installation	7 - 5
Removal	7 - 7
Oxygen System	7 - 8
Installation	7 - 8
100% Calibration Fixture Installation.	7 - 12
Removal	7 - 13
Humidity System	7 - 14
Preparing the Shell Assembly.	7 - 14
Installing the Humidity System (Series 00 and 01 Models).	7 - 16
Installing the Humidity System (Series 02 Models).	7 - 18
Removing the Humidity System.	7 - 20

Chapter 1

Introduction

Chapter Contents

Purpose	1 - 3
Audience	1 - 3
Organization	1 - 3
Chapter 1: Introduction	1 - 3
Chapter 2: Troubleshooting Procedures	1 - 3
Chapter 3: Theory of Operation	1 - 3
Chapter 4: Removal, Replacement, and Adjustment Procedures	1 - 3
Chapter 5: Parts List	1 - 4
Chapter 6: General Procedures	1 - 4
Chapter 7: Accessories	1 - 4
Typographical Conventions	1 - 5
Technical Definitions	1 - 7
Introduction	1 - 9
Overview	1 - 9
Operating Precautions	1 - 10
Features	1 - 10
Oval Access Doors	1 - 10
Mattress Tilt Mechanism	1 - 10
Pedestal Stand Assembly	1 - 10
Oxygen Control System (Optional)	1 - 10
Humidity System (Optional)	1 - 10
Weighing Platform (Optional)	1 - 10
Specifications	1 - 11

Physical Description	1 - 11
Electrical Description	1 - 13
Oxygen Control Description	1 - 14
Humidity Description	1 - 14
Scale Description	1 - 15
Regulations, Standards, and Codes	1 - 15
Model Identification and Series Changes	1 - 16
Safety Tips	1 - 18
Warning and Caution Labels	1 - 24

Purpose

This manual provides requirements for the Isolette® Infant Incubator normal operation and maintenance. It also includes parts lists (in chapter 5) for ordering replacement components.

Audience

This manual is intended for use by only facility-authorized personnel. Failure to observe this restriction can result in severe injury to people and serious damage to equipment.

Organization

This manual contains seven chapters.

Chapter 1: Introduction

In addition to a brief description of this service manual, chapter 1 also provides a product overview.

Chapter 2: Troubleshooting Procedures

Repair analysis procedures are contained in this chapter. Use these procedures to gather information, identify the maintenance need, and verify the effectiveness of the repair.

Chapter 3: Theory of Operation

This chapter describes the application of the mechanical, electrical, and hydraulic systems employed in this product.

Chapter 4: Removal, Replacement, and Adjustment Procedures

Chapter 4 contains the detailed maintenance procedures determined necessary in chapter 2.

Chapter 5: Parts List

This chapter contains the warranty, part-ordering procedure, and illustrated parts lists.

Chapter 6: General Procedures

Cleaning, preventive maintenance, and other general procedures are described in this chapter.

Chapter 7: Accessories

A list of additional products, that can be used in conjunction with the Isolette® Infant Incubator, is available in chapter 7. Installation procedures for these accessories are also included.

Typographical Conventions

This manual contains different typefaces and icons designed to improve readability and increase understanding of its content. Note the following examples:

- Standard text—used for regular information.
- **Boldface text**—emphasizes a word or phrase.
- **NOTE:**—sets apart special information or important instruction clarification.
- The symbol below highlights a WARNING or CAUTION:

Figure 1-1. Warning and Caution



- A WARNING identifies situations or actions that may affect patient or user safety. Disregarding a warning could result in patient or user injury.
- A CAUTION points out special procedures or precautions that personnel must follow to avoid equipment damage.
- The symbol below highlights an ELECTRICAL SHOCK HAZARD WARNING:

Figure 1-2. Electrical Shock Hazard Warning



- The symbol below indicates WARNING: CONSULT ACCOMPANYING DOCUMENTS:

Figure 1-3. Warning: Consult Accompanying Documents



- The symbol below indicates WARNING: HOT SURFACE:

Figure 1-4. Warning: Hot Surface



- The symbol below indicates WEIGHT LOAD:

Figure 1-5. Weight Load



- The symbol below indicates DANGER: EXPLOSION HAZARD—DO NOT USE IN THE PRESENCE OF FLAMMABLE ANESTHETICS:

Figure 1-6. Danger: Explosion Hazard—Do Not Use in the Presence of Flammable Anesthetics

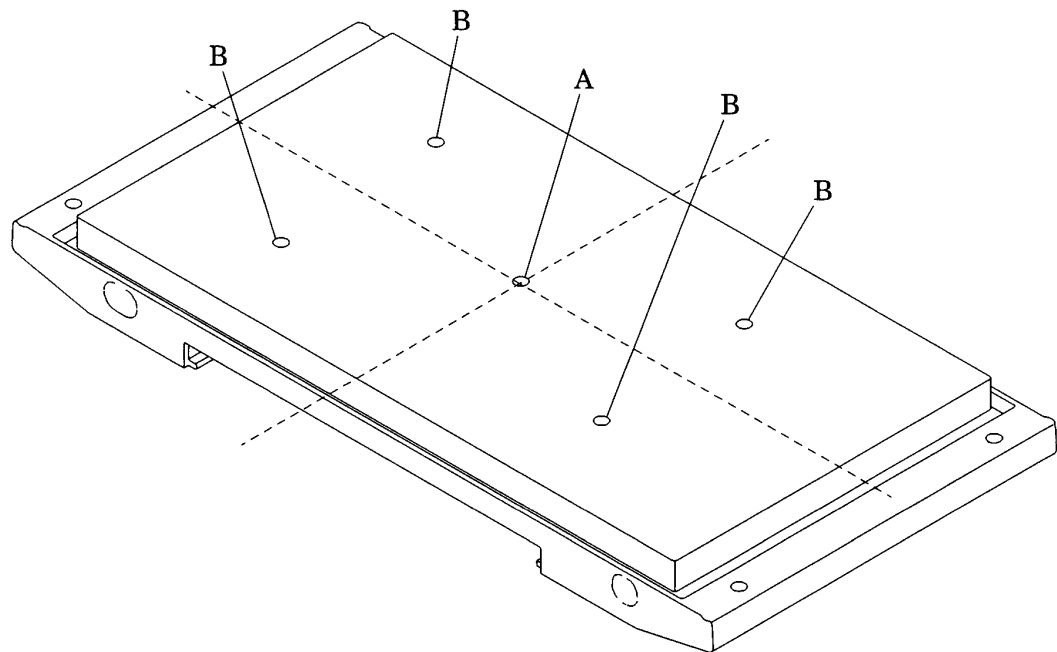


Technical Definitions

This manual contains different technical terms. Note the following definitions:

- **Incubator temperature**—The air temperature at a point 4" (10 cm) above and centered over the mattress surface.
- **Control temperature**—The temperature controller's set point selected by the user.
- **Average incubator temperature**—The average of the maximum and minimum incubator temperatures achieved during temperature equilibrium.
- **Incubator temperature equilibrium**—The condition reached when the average incubator temperature does not vary more than 1°C over a period of one hour. These measurements are taken at the control temperatures of 90°F (32°C) and 97°F (36°C).
- **Temperature uniformity**—The amount by which the average temperature of each of four points 4" (10 cm) above the mattress surface differs from the average incubator temperature at incubator temperature equilibrium.
- **Temperature rise time**—The time required for the incubator temperature to rise 20°F (11°C), when the air control temperature is at least 22°F (12°C) above the ambient temperature.
- **Temperature overshoot**—The amount by which incubator temperature exceeds average incubator temperature at incubator temperature equilibrium as a result of an increase in control temperature. Additionally, the incubator temperature equilibrium shall be restored within 15 min as a result of an increase in control temperature value.
- **Temperature correlation: Incubator temperature versus control temperature**—The amount the air temperature indicator at incubator temperature equilibrium differs from the control temperature.
- **Temperature correlation: Temperature indicator versus control temperature**—The amount the air temperature indicator in air mode at incubator temperature equilibrium differs from the control temperature.
- **Measurement points**—Measurements are taken at five points in a plane parallel to and 4" (10 cm) above the mattress surface: One point (A) is 4" (10 cm) above the center of the mattress, and the remaining four points (B) are the centers of four areas formed by lines that divide both the width and length into two parts (see figure 1-7 on page 1-8).

Figure 1-7. Measurement Points



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Introduction

Overview

The Model C2000 Isolette® Infant Incubator provides a therapeutic environment for the care for low birth-weight neonates. The Model C2000 Isolette® Infant Incubator provides the following features:

- Data trending—The unit graphically trends critical data, such as air temperature, skin temperature, heater power, oxygen, and humidity, for intervals of 12 to 24 hours, and up to seven days for weight changes.
- Thermal performance—The unit's thermal management capabilities provide a patented dual-air curtain that reduces radiant heat loss from the infant by warming the surface of the inner hood.
- Bi-directional airflow—Bi-directional airflow minimizes temperature fluctuations within the incubator when the access doors are opened. A microprocessor controller quickly and accurately regulates temperature, humidity, and oxygen levels within the incubator.
- Low operating sound levels—The unit's low operating sound levels ensure a developmentally-supportive environment for infants.
- Centralized care for multiple births—The unit allows for co-bedding, enabling the caregiver to monitor and care for multiple births. The incubator mattress provides the needed space to care for two infants and enough room for both to grow comfortably.
- Integrated x-ray cassette tray—Located beneath the mattress, the x-ray cassette tray slides out smoothly to avoid disturbing the baby.
- Infant access—By using the front and side access, two clinicians can simultaneously care for an infant while he or she remains in the incubator, reducing handling and adverse stimulation.
- Servo-controlled oxygen—Oxygen delivery is simplified by selecting and controlling whole hood oxygen concentrations from 21% to 65%. Calibration can be performed in room air or in 100% oxygen. The process can be done while the caregiver monitors the infant, without interfering with the thermal environment.
- Servo-controlled humidity—The front-loading humidity reservoir requires filling only once every 24 hours. The caregiver can set the desired relative humidity, minimizing the infant's evaporative heat loss.
- Remote monitoring—An RS-232 port and the VueLink™¹ software enable the user to view patient parameters from the Isolette® Infant Incubator on a bedside patient monitor or a central monitoring system.

1. VueLink™ is trademark of Philips Medical Systems.

Operating Precautions

For additional operating precautions for the Isolette® Infant Incubator and its accessories, refer to the *Isolette® Infant Incubator User Manual*.

Features

Oval Access Doors

Dual access doors are provided with a quiet latch.

Mattress Tilt Mechanism

A mattress tilt mechanism is provided, and is continuously variable from 0° to 12° from either end.

Pedestal Stand Assembly

The pedestal stand assembly is available in two models: fixed height and variable height adjustable.

Oxygen Control System (Optional)

The oxygen control system monitors and controls the oxygen concentration level within the incubator hood environment.

Humidity System (Optional)

The humidity system monitors and controls the humidity level within the incubator hood environment.

Weighing Platform (Optional)

A weighing platform located under the mattress measures the weight of the infant.

Specifications

Physical Description

For the physical specifications of the Model C2000 Isolette® Infant Incubator, see table 1-1 on page 1-11.

Table 1-1. Physical Specifications

Feature	Dimension
Height from floor (fixed pedestal stand model)	56" \pm ½" (142 cm \pm 12.7 mm)
Height from floor (variable height adjustable model)	52½" \pm ½" to 60" \pm ½" (133.35 cm \pm 12.7 mm to 152 cm \pm 12.7 mm)
Mattress to floor (fixed pedestal stand model)	39¾" \pm ½" (100.97 cm \pm 12.7 mm)
Mattress to floor (variable height adjustable model)	35½" \pm ½" to 43½" \pm ½" (90.17 cm \pm 12.7 mm to 110.49 cm \pm 12.7 mm)
Depth	< 23½" (59.69 cm)
Overall width with tilt knobs	< 41" (104 cm)
Weight (fixed pedestal stand model without options or accessories)	195 lb (88 kg)
Weight (variable height adjustable model without options or accessories)	200 lb (91 kg)
IV pole maximum static load	10.4 lb (4.7 kg)
Monitor shelf maximum static load	25 lb (11 kg)
Mattress tray width	31" (79 cm)
Mattress tray depth	16" (41 cm)
Mattress Trendelenburg/Reverse Trendelenburg tilt	Continuously variable to 12° \pm 1°
Environmental temperature operating range	68°F (20°C) to 86°F (30°C)
Storage temperature	-4°F (-20°C) to 140°F (60°C)
Air Mode temperature range	68°F (20°C) to 98.6°F (37.0°C)
Air Mode temperature range in Temperature Override Mode	98.6°F (37.0°C) to 102.2°F (39.0°C)

Feature	Dimension
Skin Mode temperature range	93.2°F (34.0°C) to 98.6°F (37.0°C)
Skin Mode temperature range in Temperature Override Mode	93.2°F (34.0°C) to 100.4°F (38.0°C)
Temperature rise time, typical at 72°F (22°C) ambient	< 35 minutes
Temperature variability	< 0.5°C maximum
Temperature overshoot	< 0.5°C maximum
Temperature uniformity	< 0.8°C
Correlation of the indicated air temperature to the actual incubator temperature after temperature equilibrium is reached	≤ 0.8°C

Electrical Description

For Isolette® Infant Incubator electrical specifications, see table 1-2 on page 1-13.

Table 1-2. Electrical Specifications

Feature	Dimension
Power requirements of an incubator with a fixed height pedestal stand (100V and 120V models)	100V/120V \pm 10%, 50/60 Hz, 630 W maximum
Power requirements of an incubator with a variable height adjustable (VHA) pedestal stand (100V and 120V models)	100V/120V \pm 10%, 50/60 Hz, 1900 W maximum
Power requirements of an incubator with a fixed height or a VHA pedestal stand (220V and 240V models)	220V or 240V \pm 10%, 50/60 Hz, 2376 W maximum
Convenience outlets (100V and 120V models)	100V/120V \pm 10%, 50/60 Hz, 500 W maximum
Convenience outlets (220V and 240V models)	220V or 240V, 500 W maximum
Chassis current leakage (110V and 120V models)	300 μ A or less
Chassis current leakage (220V and 240V models)	500 μ A or less

Oxygen Control Description

For Isolette® Infant Incubator oxygen control specifications, see table 1-3 on page 1-14.

Table 1-3. Oxygen Control Specifications

Feature	Dimension
Oxygen display range	18% to 100%
Oxygen display resolution	1% oxygen
Oxygen display accuracy (100% calibration)	± 3%
Oxygen display accuracy (21% calibration)	± 5%
Oxygen set resolution	1%
Oxygen setpoint range	21% to 65%

Humidity Description

For Isolette® Infant Incubator humidity specifications, see table 1-4 on page 1-14.

Table 1-4. Humidity Specifications

Feature	Dimension
Operating range	5% to 99% relative humidity (RH), non-condensing
Storage range	0% to 99% RH, non-condensing
Operating time without refilling	> 24 hours maximum at 85% RH
Humidity control accuracy at 10% to 80% at 68°F (20°C) to 104°F (60°C)	± 6% RH
Maximum humidity level at the incubator's set temperature of 102°F (39°C)	> 85% RH
Humidity setpoint range	30% to 95% RH

Scale Description

For Isolette® Infant Incubator scale specifications, see table 1-5 on page 1-15.

Table 1-5. Scale Specifications

Feature	Dimension
Weight display range	0 kg (0 lb) to 7 kg (15 lb)
Weight display resolution	1 g or 1 oz
Weight display accuracy	$\pm 2 \text{ g (0.07 oz)} \leq 2 \text{ kg (4.4 lb)}$ or $\pm 5 \text{ g (0.18 oz)} \geq 5 \text{ kg (11 lb)}$
Weight zeroing limit during infant weighing	$> 3.5 \text{ kg (7.7 lb)}$

Regulations, Standards, and Codes

The Model C2000 Isolette® Infant Incubator meets the following specifications:

- IEC 601-1
- IEC 601-2-19
- UL-2601
- With respect to the International Electrotechnical Commission (IEC) 601-1, the incubator is Class 1, Type BF.
- On the variable height adjustable model, the mode of operation is continuous operation with short-time loading.

Model Identification and Series Changes

For Isolette® Infant Incubator model identification, see table 1-6 on page 1-16.

Table 1-6. Model Identification

Model/Series Number	Description
C2000	Isolette® Infant Incubator

For Isolette® Infant Incubator hood/shell assembly series identification, see table 1-7 on page 1-16.

Table 1-7. Series Identification for the Hood/Shell Assembly

Model/Series Number	Description
C2HS-1, C2HS1-400	Isolette® Infant Incubator hood/shell assembly with panel slide latches
C2HS01, C2HS-1, C2HS-1400	Isolette® Infant Incubator hood/shell assembly with pawl latches
C2HS-02	Isolette® Infant Incubator hood/shell assembly with hood lock
C2HS-03	Isolette® Infant Incubator hood/shell assembly with modification 170

For Isolette® Infant Incubator controller series identification, see table 1-8 on page 1-16.

Table 1-8. Series Identification for the Controller

Model/Series Number	Description
C2C-2-00	Isolette® Infant Incubator controller

For Isolette® Infant Incubator fixed height pedestal stand assembly series identification, see table 1-9 on page 1-17.

Table 1-9. Series Identification for the Fixed Height Pedestal Stand Assembly

Model/Series Number	Description
C2STD1-00	Isolette® Infant Incubator fixed height pedestal stand assembly with upper and lower column extrusion
C2STD1-01	Isolette® Infant Incubator fixed height pedestal stand assembly with upper and lower column weldment
C2STD2-00	Isolette® Infant Incubator fixed height pedestal stand assembly

For Isolette® Infant Incubator variable height adjustable pedestal stand assembly series identification, see table 1-10 on page 1-17.

Table 1-10. Series Identification for the Variable Height Adjustable Stand Assembly

Model/Series Number	Description
C2VHA-1-00	Isolette® Infant Incubator variable height adjustable pedestal stand assembly

For Isolette® Infant Incubator humidity system series identification, see table 1-11 on page 1-17.

Table 1-11. Series Identification for the Humidity System

Model/Series Number	Description
C2RH-1-00	Isolette® Infant Incubator humidity system
C2RH-1-01	Isolette® Infant Incubator humidity system
C2RH-2-00	Isolette® Infant Incubator humidity system with manifold assembly

Safety Tips



WARNING:

Only facility-authorized personnel should troubleshoot the Model C2000 Isolette® Infant Incubator. Troubleshooting by unauthorized personnel could result in personal injury or equipment damage.



WARNING:

Do not use the incubator if it fails to function as described. Personal injury or equipment damage could occur. Refer the unit for servicing by qualified personnel.



WARNING:

To prevent personal injury or damage to the variable height adjustable pedestal stand when transporting, employ a person of sufficient strength to adequately control the incubator.



WARNING:

A dirty air intake microfilter may affect oxygen concentrations and/or cause carbon dioxide build-up. Check the filter routinely, and change it at least every 3 months or when it is visibly dirty. Failure to do so could result in infant injury.



WARNING:

Two people are required to lift the hood assembly. Failure to use at least two people could result in personal injury or equipment damage.



WARNING:

Allow 45 minutes for the heater assembly to cool. Failure to do so could result in personal injury.



WARNING:

Follow the product manufacturer's instructions. Failure to do so could result in personal injury or equipment damage.



WARNING:

Make sure that the oxygen supply to the incubator is turned off and that the incubator is disconnected from the oxygen supply when performing cleaning procedures. A fire and explosion hazard exists when cleaning in an oxygen-enriched environment.



WARNING:

Failure to clean the heater radiator and fan impeller could result in sufficient lint build-up to reduce airflow, which will affect temperature control and cause high oxygen concentrations. Infant injury could occur.



WARNING:

Only facility-authorized personnel should perform preventive maintenance on the Model C2000 Isolette® Infant Incubator. Preventive maintenance performed by unauthorized personnel could result in personal injury or equipment damage.



WARNING:

Make sure that the oxygen supply to the incubator is turned off and that the incubator is disconnected from the oxygen supply when performing maintenance procedures. A fire and explosion hazard exists when performing maintenance procedures in an oxygen-enriched environment.



WARNING:

The hood/shell assembly **must** attach to the pedestal/stand using the screws provided. Failure to do so could result in the hood/shell assembly separating from the pedestal stand when sufficiently tilted, particularly with the hood open. Personal injury or equipment damage could occur.



WARNING:

To keep the incubator from sliding when parked on an incline, the pedestal stand's front locking casters must be facing down the incline and locked.



WARNING:

For the 21% oxygen calibration, the unit **must** be equipped with a standard sensor module lock. Failure to use a standard sensor module could result in incorrect calibration. Infant injury could occur.



WARNING:

For the 100% oxygen calibration procedure, the incubator hood **must** be equipped with the 100% calibration fixture. Failure to use the 100% calibration fixture could result in incorrect calibration. Infant injury could occur.



WARNING:

Oxygen flow rates cannot be used as an accurate indication of oxygen concentration in an incubator. Continuously monitor the oxygen concentrations with a calibrated oxygen analyzer. Failure to do so could result in personal injury or equipment damage.



WARNING:

Ensure all sensor leads are properly routed. Use cable management clips to avoid entanglement and possible infant injury.



SHOCK HAZARD:

Ensure that the building power source is compatible with the electrical specifications shown on the right side of the incubator and the variable height adjustable pedestal stand. For proper grounding reliability, connect the power cord only to a properly marked, three-wire, hospital-grade or hospital-use receptacle. Do not use extension cords.



SHOCK HAZARD:

Unplug the unit from its power source. Failure to do so could result in personal injury or equipment damage.



SHOCK HAZARD:

Unplug the power cord from the controller assembly. Failure to do so could result in personal injury or equipment damage.



SHOCK HAZARD:

Do not expose the unit to excessive moisture. Personal injury or equipment damage could occur.



CAUTION:

When using the variable height adjustable pedestal stand, always lower the incubator to its lowest position prior to transport for optimum stability. Failure to do so could result in personal injury or equipment damage.



CAUTION:

Replace **both** oxygen sensor cells at the same time. Failure to do so could result in equipment damage.



CAUTION:

When reconnecting the rear panel connectors, connect the sensor module-to-connector cable assembly to the sensor module connector **only**. Do **not** connect the sensor module cable to the RS-232 connector. Equipment damage could occur.



CAUTION:

Always replace Nylok®¹ screws; do **not** reuse them. Equipment damage could occur.



CAUTION:

Use caution when lowering the shell assembly in place on the shell bottom. Ensure that no cables are pinched and that the extrusion bumper fits properly. Failure to do so could result in equipment damage.



CAUTION:

Do not use harsh cleansers, such as scouring pads or heavy-duty grease removers or solvents, such as acetone. Equipment damage could occur.

1. Nylok® is a registered trademark of Nylok Fastener Corporation.



CAUTION:

Some chemical cleaning agents may be conductive and/or leave a residue that may enable a build-up of conductive dust or dirt. Do **not** permit cleaning agents to contact electrical components. Do **not** spray cleaning solutions onto any of these surfaces. Equipment damage could occur.



CAUTION:

When cleaning the interior of the incubator shell, prevent liquids from entering the motor shaft opening. Equipment damage could occur.



CAUTION:

Do not use alcohol for cleaning. Alcohol can cause crazing of the clear acrylic hood.



CAUTION:

Do not expose the hood assembly to direct radiation from germicidal lamps. Ultraviolet radiation from these sources can cause cracking of gaskets, fading of paint, and crazing of the clear acrylic hood.



CAUTION:

To prevent component damage, ensure that your hands are clean, and **only** handle the P.C. board by its edges.



CAUTION:

When handling electronic components, wear an antistatic strap. Failure to do so could result in component damage.



CAUTION:

For shipping and storage, place the removed P.C. board in an antistatic protective bag. Equipment damage can occur.



CAUTION:

Do not use silicone-based lubricants. Equipment damage could occur.



CAUTION:

When removing the equipment from the cartons, take care not to scratch or otherwise damage unprotected surfaces.



CAUTION:

Before lifting the incubator hood for cleaning, ensure that all mounted accessories have been removed to prevent possible interference with the raised hood.



CAUTION:

To avoid equipment damage, use **only** distilled or sterile distilled water. Sterile water alone is **not** an acceptable substitute for distilled water.



CAUTION:

Use **only** the programming cable assembly (P/N 83 930 70) to install the software update. Using a standard RS-232 cable assembly could result in equipment damage.

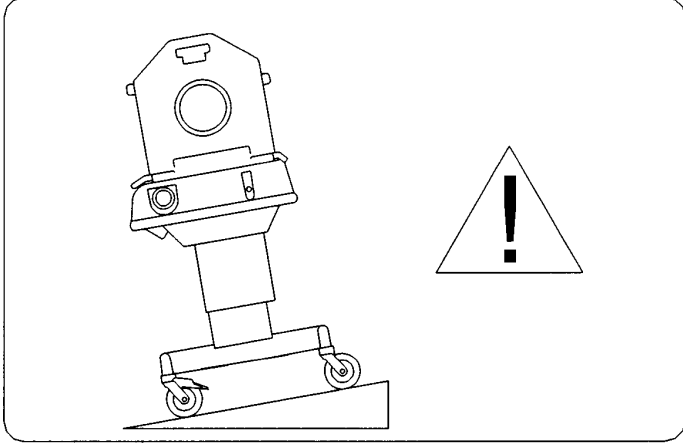



CAUTION:


To prevent damage to the collar that secures the evaporator assembly to the shell assembly, be careful not to twist the evaporator assembly around the horizontal axis when installing its tubing.

Warning and Caution Labels


Figure 1-8. Warning and Caution Labels












11 lbs
(5.0 kg)





11 lbs
(5.0 kg)



OXYGEN CONCENTRATION GUIDE


OXYGEN SUPPLY	APPROX. OXYGEN %
3 LPM	30-45
6 LPM	40-60
9 LPM	45-75
12 LPM	50-85
15 LPM	60-90

ALLOW OXYGEN CONCENTRATIONS TO STABILIZE

WARNING:
OXYGEN FLOW RATES CAN NOT BE USED AS AN ACCURATE INDICATION OF OXYGEN CONCENTRATIONS IN AN INCUBATOR. OXYGEN CONCENTRATIONS MUST BE CONTINUOUSLY MONITORED WITH A CALIBRATED OXYGEN ANALYZER


INLET 1
↓

IMPORTANT:
INSPECT AIR FILTER
DURING CLEANING
REPLACE IF NECESSARY



WARNING:


- IMPROPER USE OF SUPPLEMENTAL OXYGEN MAY BE ASSOCIATED WITH SERIOUS SIDE EFFECTS. OXYGEN SHOULD ONLY BE ADMINISTERED BY PROPERLY TRAINED PERSONNEL UNDER THE DIRECTION OF A QUALIFIED ATTENDING PHYSICIAN.
- THE OXYGEN CONCENTRATION INSPIRED BY AN INFANT DOES NOT ACCURATELY DETERMINE THE PARTIAL PRESSURE OF OXYGEN (pO₂) IN THE BLOOD. THE pO₂ SHOULD BE MEASURED BY AN ACCEPTED CLINICAL TECHNIQUE WHEN ADVISED BY THE ATTENDING PHYSICIAN.
- FIRE HAZARD - KEEP MATCHES AND OTHER SOURCES OF IGNITION OUT OF ROOM IN WHICH OXYGEN IS IN USE. COMBUSTIBLE MATERIALS ARE EASILY IGNITED AND BURN WITH GREAT INTENSITY IN OXYGEN ENRICHED AIR.
- USE OF ANESTHETIC AGENTS CAN INTERFERE WITH OXYGEN ANALYZER ACCURACY.

 **DANGER: EXPLOSION HAZARD DO NOT USE IN THE PRESENCE OF FLAMMABLE ANESTHETICS**


IMPORTANT:
DO NOT APPLY OXYGEN
TO INLET 1 AND INLET 2
SIMULTANEOUSLY.

OXYGEN CONTROLLER
MAX. PRESSURE 150 PSI
(10.55 Kg/cm²)
MIN. FLOW: 30 LPM


INLET 2
↓



- CAUTION -
MAXIMUM 2 LBS
WEIGHT (.91 Kg)



- CAUTION -
MAXIMUM 5 LBS
WEIGHT (2.2 Kg)



- CAUTION -
MAXIMUM 10 LBS
WEIGHT (4.5 Kg)

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Chapter 2

Troubleshooting Procedures

Chapter Contents

Getting Started	2 - 5
Initial Actions	2 - 5
Function Checks	2 - 6
Final Actions	2 - 22
Alarms	2 - 23
High and Low Air and Skin Temperature Alarms	2 - 23
Alarm and System Prompt Messages	2 - 24
System Failure Messages	2 - 31
Diagnostic Menus	2 - 33
Entering the System Configuration Menu	2 - 33
Entering the Diagnostic Information Menu	2 - 35
System Test Menu	2 - 38
System Test (1 of 3) Menu	2 - 38
System Test (2 of 3) Menu	2 - 40
System Test (3 of 3) Menu	2 - 41
Key Check Display	2 - 43
Data Summary Menu	2 - 44
Data Summary (1 of 2) Menu	2 - 44
Data Summary (2 of 2) Menu	2 - 46
There Is No Power, and Power Failure Alarm Does Not Activate	2 - 49
Variable Height Adjustable (VHA) Pedestal/Stand Does Not Move Up or Down	2 - 50
Skin Set Temperature Cannot Be Achieved or Maintained	2 - 52

Oxygen Concentration is Low	2 - 54
Oxygen Concentration is High	2 - 56
Hood Does Not Tilt or Close Properly	2 - 58
Controller Failure #1—EEPROM Circuitry Failure.	2 - 61
Controller Failure #2—Ambient Air Probe Failure	2 - 62
Controller Failure #4—Controller Cooling Fan Failure.	2 - 63
Controller Failure #5—Display Test Failure	2 - 64
Controller Failure #7—Power Supply Voltage Failure	2 - 65
Controller Failure #8—RAM Test Failure	2 - 66
Controller Failure #9—Real-Time Clock Failure.	2 - 67
Controller Failure #10—Watchdog Timer Failure.	2 - 68
Controller Failure #11—Relay Test Failure	2 - 69
Controller Failure #13—Heater Circuit Failure Detected	2 - 70
Controller Failure #14—Low Heater Current Detected	2 - 71
Heater Thermocouple Does Not Work Properly	2 - 72
Humidity Heater Draws Too Much Current.	2 - 74
Motor Fails	2 - 75
Communication Between the Sensor Module and the Controller Fails	2 - 76
Sensor Module Is Out of Position.	2 - 78
A Stuck Key Is Detected.	2 - 79
Unit Fails the Non-Volatile Memory (NVM) Integrity Test	2 - 80
Access Panel Assembly Does Not Latch Properly	2 - 81
Iris Entry Port Does Not Open or Close Properly	2 - 83
Access Door Does Not Operate or Latch Properly.	2 - 84
Heat Shield Does Not Latch Properly.	2 - 86
Mattress Tray Does Not Tilt Properly	2 - 88
Mattress Tray Is Damaged	2 - 90
Air Intake Is Not Working Properly	2 - 92
X-ray Tray Does Not Operate Properly	2 - 94
Sensor Module Lock Does Not Secure the Sensor Module (Units Equipped With the Sensor Module Lock Only)	2 - 96

Incubator Takes Longer Than One Hour to Warm Up to the Air Set Temperature	2 - 97
Air Set Temperature Cannot Be Maintained	2 - 99
Low Air Temperature Alarm or High Air Temperature Alarm Does Not Sound When Air Temperature Drops or Rises Out of Specification	2 - 100
Low Skin Temperature Alarm or High Skin Temperature Alarm Does Not Sound When Skin Temperature Drops or Rises Out of Specification	2 - 101
When Skin Probes are Disconnected, Connect Skin 1 Probe Alarm Does Not Sound	2 - 102
Incubator's Air Temperature Exceeds Air Set Temperature by 1.5°C or Greater, or Infant's Skin Temperature Exceeds Skin Set Temperature by 1.0°C or Greater	2 - 103
Humidity System Is Not Working Properly	2 - 104
Power Failure Alarm Sounds	2 - 106
Skin 1 Probe Does Not Work Properly	2 - 107
Oxygen System Is Not Working Properly (Units Equipped With an Oxygen System Only)	2 - 110
Poor Air Circulation Exists Within the Incubator	2 - 111
Sensor Module Assembly Fails	2 - 112
Remove Skin 2 Probe Alarm Sounds	2 - 113
Scale Is Not Working Properly	2 - 114
Oxygen System's Cal Fail System Prompt Message Appears	2 - 117
Controller Failure #15—Invalid Parameter in NVRAM	2 - 118
Controller Failure #16—NVRAM Integrity Failure	2 - 119
Controller Failure #17—Non-volatile RAM Parameter Consistency Check Failure	2 - 120

NOTES:

Getting Started

**WARNING:**

Only facility-authorized personnel should troubleshoot the Model C2000 Isolette® Infant Incubator. Troubleshooting by unauthorized personnel could result in personal injury or equipment damage.

Begin each procedure in this chapter with step 1. Follow the sequence outlined (each step assumes the previous step has been completed). In each step, the normal operation of the product can be confirmed by answering **Yes** or **No** to the statement. Your response will lead to another step in the procedure, a repair analysis procedure (RAP), or a component replacement. If more than one component is listed, replace them in the given order.

To begin gathering information about the problem, start with **Initial Actions**.

To isolate or identify a problem and to verify the repair after completing each corrective action (replacing or adjusting a part, seating a connector, etc.), perform the **Function Checks**.

To verify the repair, perform the **Final Actions** after the Function Checks.

If troubleshooting procedures do not isolate the problem, call Technical Support at (800) 437-2437 for assistance.

Initial Actions

To gather information from operators concerning problems with the Isolette® Infant Incubator, use Initial Actions. Note symptoms or other information concerning the problem that the operator describes. This information helps identify the probable cause.

1. Someone who can explain the problem is available.

Yes No



→ Go to “Function Checks” on page 2-6.

2. Ask that person to demonstrate or explain the problem. The problem can be duplicated.

Yes No



→ Go to “Function Checks” on page 2-6.

3. The problem is a result of improper operator action.

Yes **No**
↓ → Go to “Function Checks” on page 2-6.

4. Instruct the operator to refer to the procedures in the *Isolette® Infant Incubator User Manual* (usr032). To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

Function Checks

NOTE:

Perform Function Checks before the incubator is first placed into service and after any disassembly for cleaning or maintenance.



WARNING:

Do not use the incubator if it fails to function as described. Personal injury or equipment damage could occur. Refer the unit for servicing by qualified personnel.



SHOCK HAZARD:

Ensure that the building power source is compatible with the electrical specifications shown on the right side of the incubator and the variable height adjustable pedestal stand. For proper grounding reliability, connect the power cord only to a properly marked, three-wire, hospital-grade or hospital-use receptacle. Do not use extension cords.



WARNING:

To prevent injury or damage to the variable height adjustable pedestal stand when transporting, employ a person of sufficient strength to adequately control the incubator.



CAUTION:

When using the variable height adjustable pedestal stand, always lower the incubator to its lowest position prior to transport for optimum stability.

1. Initial Actions have been performed.

Yes **No**
↓ → Go to “Initial Actions” on page 2-5.

2. Connect the AC power cord to the pedestal stand, and apply power:

- a. Plug the power cord into an appropriate power source.
- b. Press the **Power** switch on the pedestal stand.
- c. Press the **Power** switch on the incubator's controller.

NOTE:

When turned on, the unit performs a self-test indicated by the **Power-Up Tests** screen. After the self-test, **Display #1** appears.

All indicator lamps light, and the audible alarm pulses.

Yes No

↓ → The unit fails the self-test, the alarm sounds, and one or more system failure messages appear in the **Trend** display on **Display #1**. Go to "System Failure Messages" on page 2-31.

3. The **Trend** display is free from any alarm or system prompt messages.

Yes No

↓ → Go to "Alarms" on page 2-23.

4. Perform the following:

- a. Allow the unit to operate for at least 3 minutes.
- b. Check the **Power Failure** alarm by unplugging the power cord from its power source.

The **Power Failure** alarm sounds, and the **Power Fail** light-emitting diode (LED) on the controller actuates.

Yes No

↓ → Go to RAP 2.1 on page 2-49.

5. Perform the following:

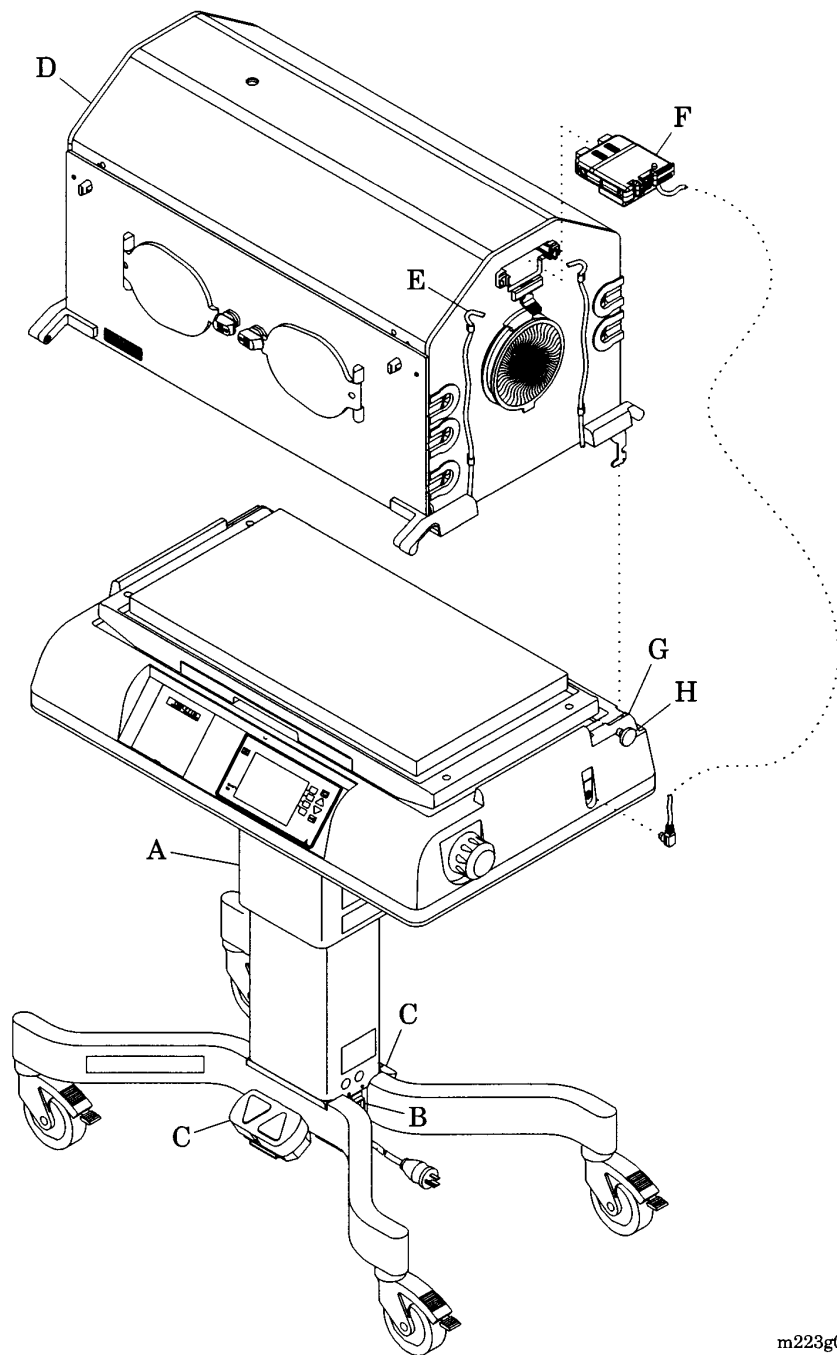
- a. Plug the power cord into an appropriate power source. Ensure that the power cord is fully plugged into the wall, the pedestal stand, and the incubator receptacles.
- b. Set the air set temperature to 95°F (35°C). Allow the unit to operate while checking the hood/shell.

The unit has a variable height adjustable (VHA) pedestal stand (A) (see figure 2-1 on page 2-8).

Yes No

↓ → Go to step 8.

Figure 2-1. Isolette® Infant Incubator



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6. Perform the following to check the operation of the VHA pedestal/stand (A):
 - a. Using your foot, press the **Up** arrow on the front **Up/Down** switch (C) to raise the VHA pedestal/stand (A) to the maximum height.
 - b. Press and hold the **Down** arrow on the **Up/Down** switch (C) to lower the VHA pedestal/stand (A) to the minimum height.
 - c. Repeat using the rear **Up/Down** switch (C).

The VHA pedestal/stand (A) operates smoothly and adjusts to the desired height.

Yes No
↓ → Go to RAP 2.2 on page 2-50.

7. The unit is equipped with a non-locking hood assembly (D).

Yes No
↓ → Go to step 9.

8. Perform the following to check the operation of the non-locking hood assembly (D) (see figure 2-1 on page 2-8):
 - a. Disconnect the weighing scale cable (E) from the sensor module (F).
 - b. Slowly tilt the hood assembly (D) back until it comes to rest.
 - c. Close the hood assembly (D).
 - d. Connect the weighing scale cable (E) to the sensor module (F).

The hood assembly (D) opens and closes correctly.

Yes No
↓ → Go to RAP 2.6 on page 2-58.

9. The hood assembly (D) is equipped with a pivot/hood lock assembly bracket (G).

Yes No
↓ → Go to step 11.

10. On the hood assembly (D) equipped with a pivot/hood lock assembly bracket (G), perform the following:
 - a. Disconnect the weighing scale cable (E) from the sensor module (F).
 - b. Slowly tilt the hood assembly (D) back until it locks in place.
 - c. Release the hood assembly (D) by pulling and holding the knob (H) located on the right rear pivot/hood lock assembly bracket (G) while closing the hood assembly (D).

d. Connect the weighing scale cable (E) to the sensor module (F).

The pivot/hood lock assembly bracket (G) operates properly.

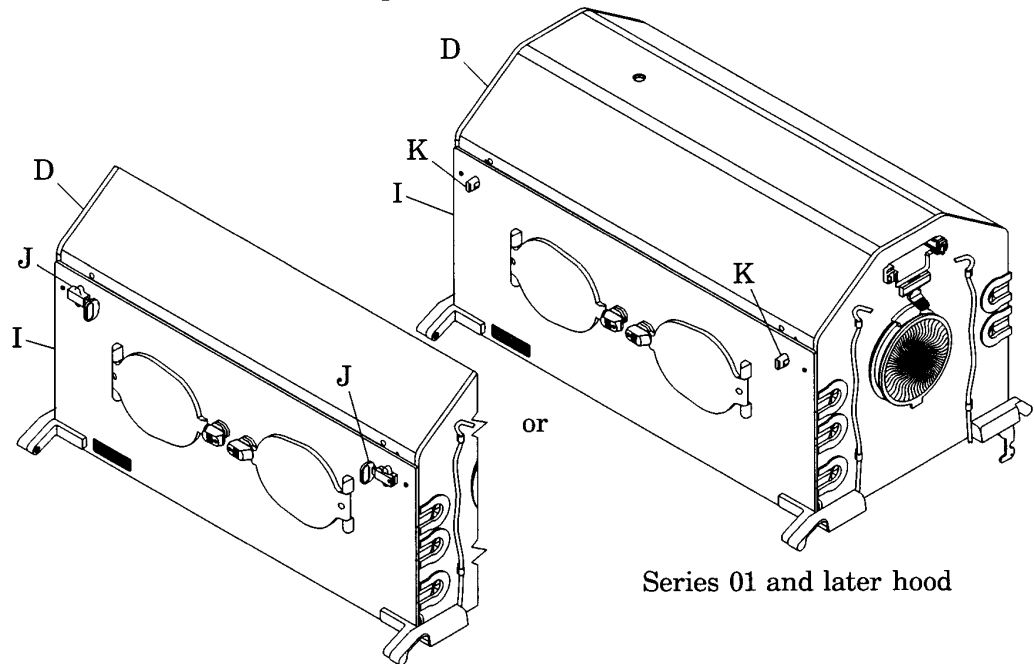
Yes No

↓

→ Go to RAP 2.6 on page 2-58.

11. Perform the following to check the operation of the access panel (I) (see figure 2-2 on page 2-10).

Figure 2-2. Access Panels



Series 00 hood

m223g126

- a. On a unit with a Series 00 hood assembly (D), slide the blue slide access panel latches (J), and open the access panel (I).
or
On a unit with a hood assembly (D) later than Series 00, rotate the access panel pawl latch knobs (K), and open the access panel (I).
- b. Pivot the access panel (I) to the full-open position so it hangs straight down.
- c. Check the rear access panel (I), if so equipped.
- d. Close each access panel (I), and secure them using the blue slide access panel latches (J) or the access panel pawl latch knobs (K).

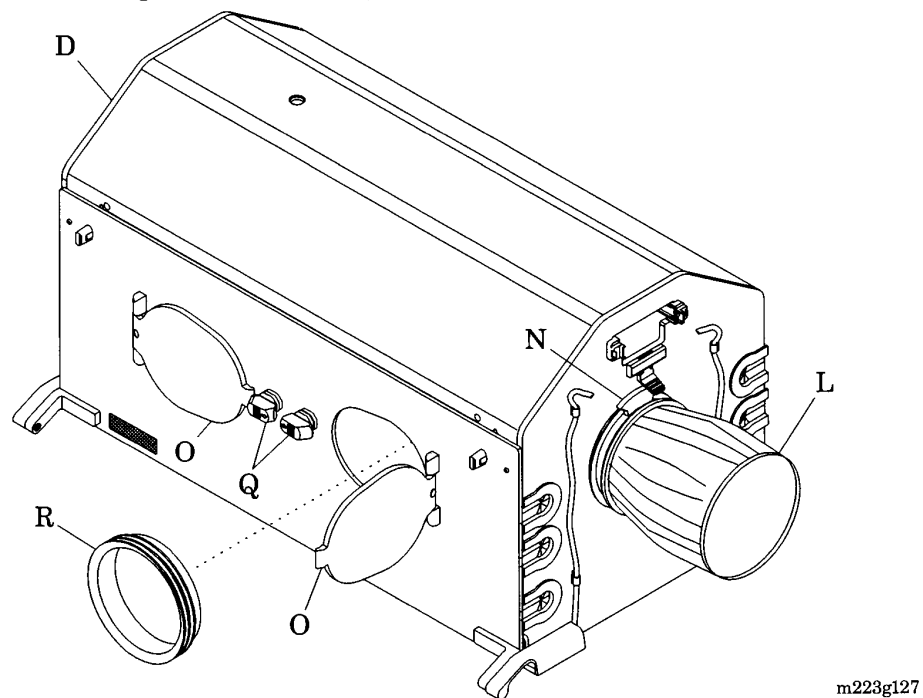
The blue slide access panel latches (J) or the access panel pawl latch knobs (K) are properly secured to avoid accidental opening of the access panel(s) (I).

Yes **No**
↓ → Go to RAP 2.25 on page 2-81.

12. The hood assembly (D) is equipped with an iris entry port (L) (see figure 2-3 on page 2-11).

Yes **No**
↓ → Go to step 14.

Figure 2-3. Iris Entry Port and Access Doors



13. Check the iris entry port (L) by rotating its outer ring (N). The iris entry port (L) opens and closes as rotation is continued through 360°.

Yes **No**
↓ → Go to RAP 2.26 on page 2-83.

14. The hood assembly (D) is equipped with an access door (O).

Yes **No**
↓ → Go to step 17.

15. Press the door release (Q) of each access door (O). Each access door (O) swings open.

Yes No



→ Go to RAP 2.27 on page 2-84.

16. Close the access doors (O), and check for proper latching and quietness. The gaskets (R) of each access door (O) are placed properly on the inner and outer walls.

Yes No

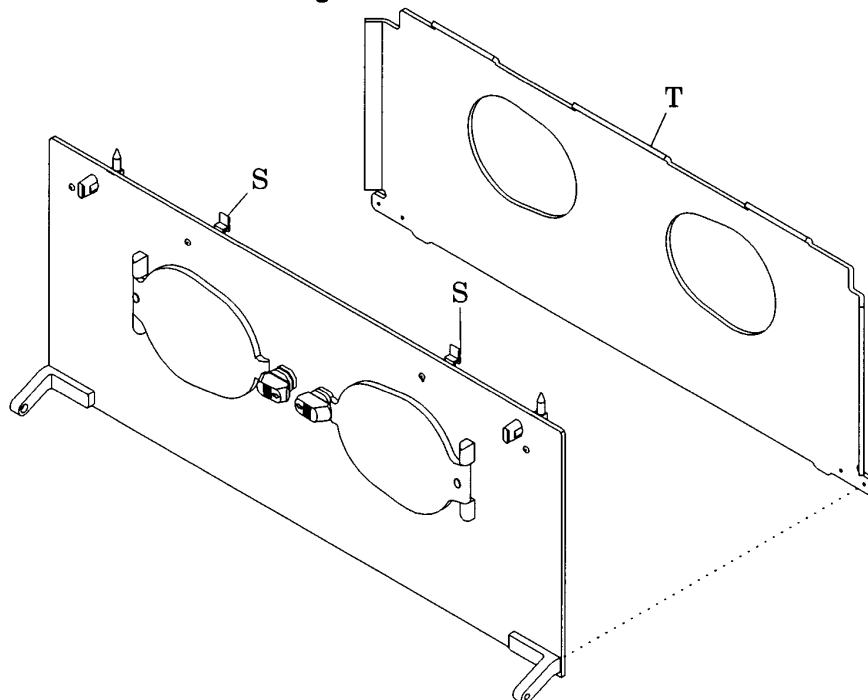


→ Go to RAP 2.27 on page 2-84.

17. Perform the following:

- a. On a unit with a Series 00 hood assembly (D), slide the blue slide access panel latches (J), and open the access panel (I) (see figure 2-2 on page 2-10).
or
On a unit with a hood assembly (D) later than Series 00, rotate the access panel pawl latch knobs (K), and open the access panel (I).
- b. Inspect the heat shield latches (S) and the heat shield (T) (see figure 2-4 on page 2-12).

Figure 2-4. Heat Shield



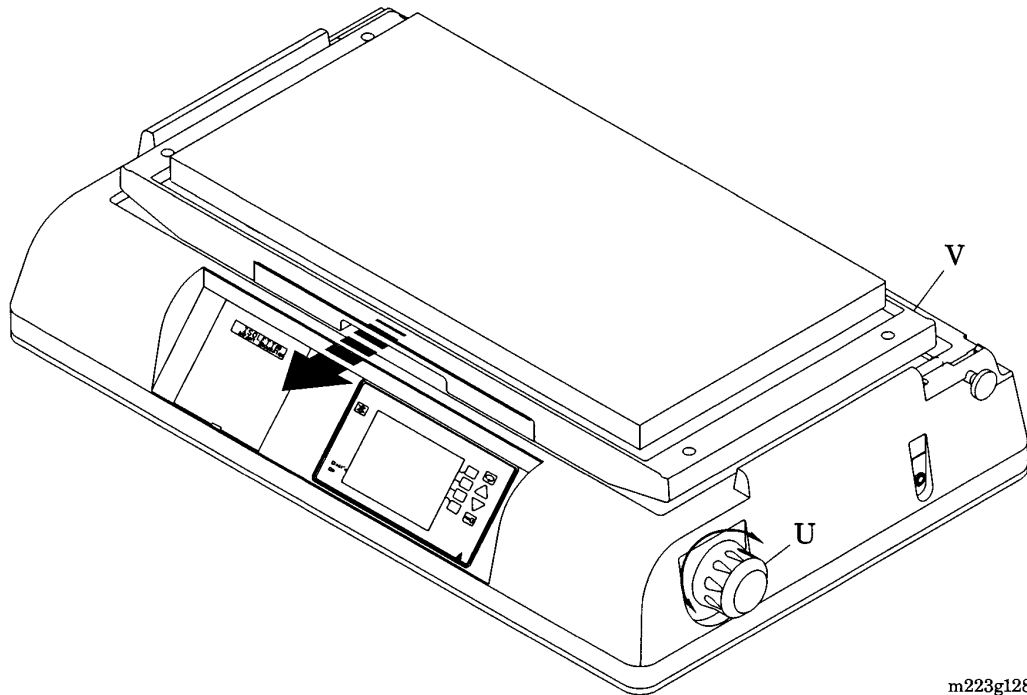
m223g129

The heat shield latches (S) properly secure the heat shield (T).

Yes **No**
↓ → Go to RAP 2.28 on page 2-86.

18. Perform the following to check the operation of the mattress tilt mechanisms:
- Check the mattress elevators by rotating the right-hand mattress tilt mechanism knob (U) counterclockwise until it stops and the right end of the mattress tray (V) is at a 12° angle (see figure 2-5 on page 2-13).

Figure 2-5. Mattress Tray Assembly



m223g128

- Rotate the right-hand mattress tilt mechanism knob (U) clockwise until it stops and the mattress tray (V) is level.
- Rotate the left-hand mattress tilt mechanism knob (U) clockwise and the left end of the mattress tray (V) is at a 12° angle.
- Rotate the left-hand mattress tilt mechanism knob (U) counterclockwise and the mattress tray (V) is level.

The mattress tray (V) correctly tilts with the rotation of the mattress tilt mechanism knobs (U).

Yes **No**
↓ → Go to RAP 2.29 on page 2-88.

19. Perform the following to check the mattress tray (V) operation:

- a. Slide out the mattress tray (V) to the fully-extended position.
- b. Gradually load a calibrated weight of 22 lb (10 kg) near the front-center of the extended mattress tray (V).

The mattress tray (V) is a firm platform for an infant.

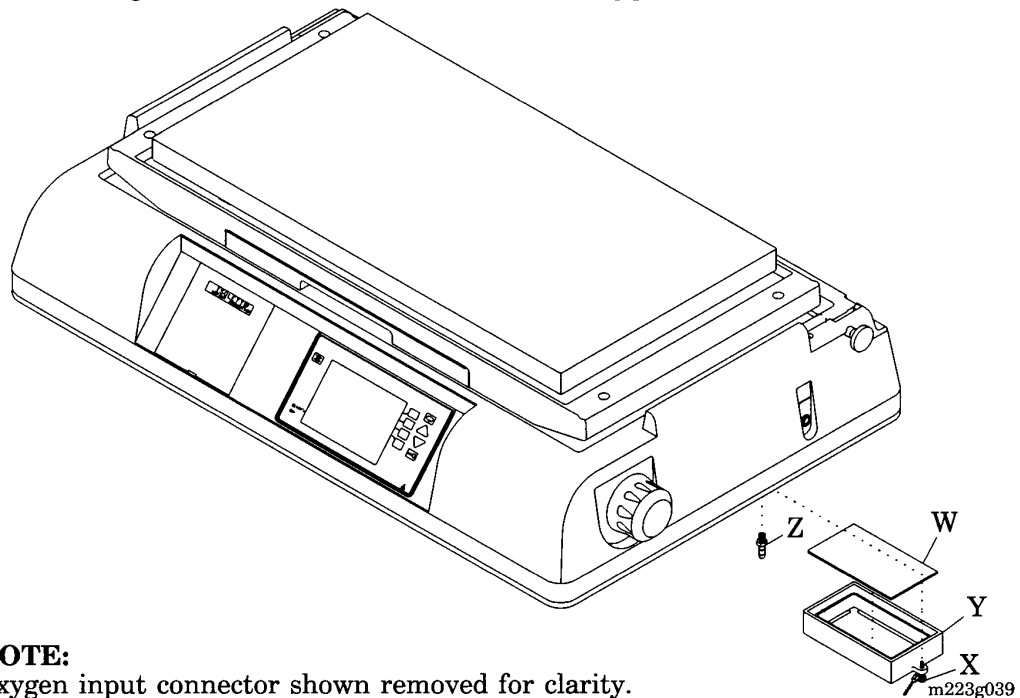
Yes No



→ Go to RAP 2.30 on page 2-90.

20. Perform the following to check the operation of the air intake microfilter (W) (see figure 2-6 on page 2-14):

Figure 2-6. Air Intake Microfilter and Oxygen Input Connector



NOTE:

Oxygen input connector shown removed for clarity.

- a. Return the mattress tray (V) to its original position (see figure 2-5 on page 2-13).
- b. Close the access panel (I), and secure it using its blue slide access panel latches (J) or its access panel pawl latch knobs (K) (see figure 2-2 on page 2-10).

**WARNING:**

A dirty air intake microfilter may affect oxygen concentrations and/or cause carbon dioxide build-up. Check the filter routinely, and change it at least every 3 months or when it is visibly dirty. Failure to do so could result in infant injury.

- c. Loosen the two thumbscrews (X) on the air intake filter cover (Y) (see figure 2-6 on page 2-14).
- d. Remove the air intake filter cover (Y) from the unit.
- e. Inspect the air intake microfilter (W).

The air intake microfilter (W) has no visible dirt.

Yes No

↓ → Go to RAP 2.31 on page 2-92.

21. Perform the following to check the operation of the air/oxygen system.

- a. Introduce 9 lpm of oxygen into the oxygen input connector (Z).
- b. Using a calibrated oxygen analyzer, monitor the oxygen levels within the hood assembly (D) (see figure 2-3 on page 2-11).

The oxygen levels meet the specification of **50% to 70%** as indicated on the rear panel of the incubator.

Yes No

↓ → Go to step 23.

22. Go to step 25.

23. The oxygen concentration level is **lower** than **50% to 70%**.

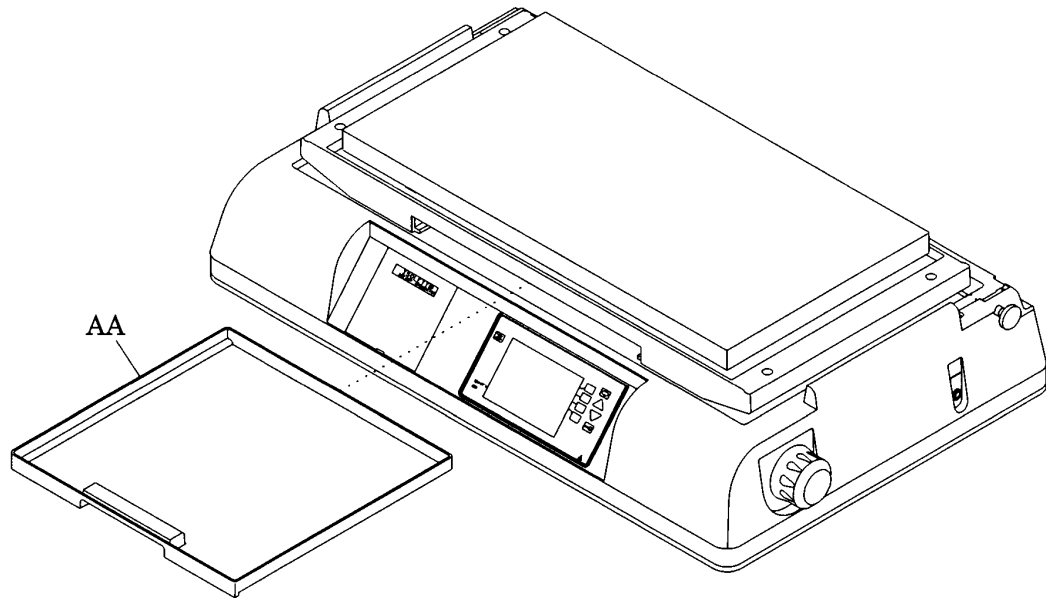
Yes No

↓ → The oxygen concentration level is **higher** than **50% to 70%**.
Go to RAP 2.5 on page 2-56.

24. Go to RAP 2.4 on page 2-54.

25. Perform the following to check the operation of the x-ray tray (AA) (see figure 2-7 on page 2-16):

Figure 2-7. X-ray Tray



m223g130

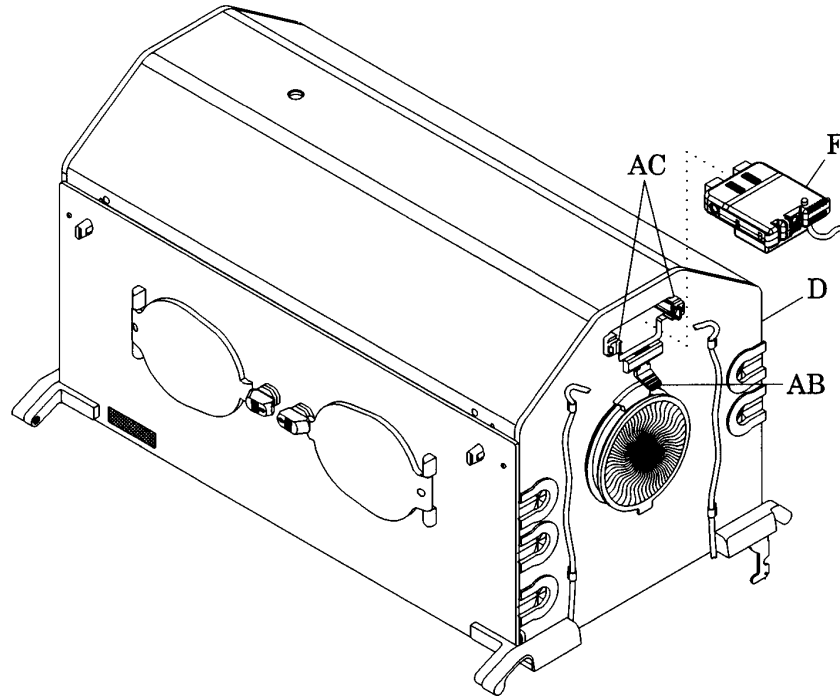
- a. On a unit with a Series 00 hood assembly (D), slide the blue slide access panel latches (J), and open the access panel (I) (see figure 2-2 on page 2-10).
or
On a unit with a hood assembly (D) other than Series 00, rotate the access panel pawl latch knobs (K), and open the access panel (I).
- b. Withdraw the x-ray tray (AA) (see figure 2-7 on page 2-16).
- c. Return the x-ray tray (AA) to its original position.
- d. Close the access panel (I), and secure it using its blue slide access panel latches (J) or its access panel pawl latch knobs (K) (see figure 2-2 on page 2-10).

The x-ray tray (AA) operates correctly (see figure 2-7 on page 2-16).

Yes	No
↓	→ Go to RAP 2.32 on page 2-94.

26. The hood assembly (D) is equipped with a sensor module lock (AB) (see figure 2-8 on page 2-17).

Figure 2-8. Sensor Module and Sensor Module Lock



m223g131

Yes **No**
↓ → Go to step 28.

27. Perform the following to check the operation of the sensor module lock (AB).
- Pull the sensor module lock (AB) down.
 - Slide the sensor module (F) out until it stops.
 - Pull the slide assemblies (AC) on the sides of the sensor module (F) to release its stop, and slide the sensor module (F) completely out of the hood assembly (D).
 - Return the sensor module (F) to the hood assembly (D). Ensure that the sensor module (F) is fully engaged in the sensor module lock (AB).
 - Push the sensor module lock (AB) up.

When the sensor module lock (AB) is raised, the sensor module (F) is locked securely in place.

Yes No

↓ → Go to RAP 2.33 on page 2-96.

28. Perform the following to check the operation of Air Mode:

- a. Close all access openings.
- b. Allow the incubator to warm up to the air set temperature of 95°F (35°C).

The incubator takes less than one hour to warm up to the air set temperature of 95°F (35°C).

Yes No

↓ → Go to RAP 2.34 on page 2-97.

29. When the **Air Temperature** display stabilizes, the digital display remains within 0.5°C of the set temperature for 15 minutes.

Yes No

↓ → Go to RAP 2.35 on page 2-99.

30. Perform the following to check the **Low Air Temperature** alarm:

- a. On a unit with a Series 00 hood assembly (D), slide the blue slide access panel latches (J), and open the access panel (I) (see figure 2-2 on page 2-10).

or

On a unit with a hood assembly (D) later than Series 00, rotate the access panel pawl latch knobs (K), and open the access panel (I).

- b. Pivot the access panel (I) to the full-open position so it hangs straight down.
- c. Allow the unit to operate.

In less than 5 minutes, the **Alarm** indicators illuminate, the **Low Air Temperature** message appears on the **Trend** display, and an alarm sounds.

Yes No

↓ → Go to RAP 2.36 on page 2-100.

31. Perform the following to check the **Low Skin Temperature** alarm:

- a. Close the access panel (I), and secure it using its blue slide access panel latches (J) or its access panel pawl latch knobs (K).
- b. Connect the skin probe to skin connector #1 on the sensor module (F) (see figure 2-8 on page 2-17).

- c. Place the skin probe 4" (10 cm) above the center of the mattress.
- d. Select Skin Mode.
- e. Set the skin set temperature to 95°F (35°C).
- f. When the temperature stabilizes, position the skin probe outside of the incubator.
- g. Allow the unit to operate.

In less than 5 minutes, the **Alarm** indicators illuminate, the **Low Skin Temperature** message appears in place of the **Trend** display, and the alarm sounds.

Yes	No
↓	→ Go to RAP 2.37 on page 2-101.

NOTE:

The sensor module is equipped to accept two skin probes. However, when the second skin probe is connected to the sensor module in Skin Mode, an alarm sounds, and the message **Remove Skin 2 Probe** appears. To connect the second skin probe, first select Air Mode, the controller then displays two temperatures.

32. Perform the following to check the **Skin Probe Disconnect** alarm:

- a. Remove the skin probe from the **2** skin connector on the sensor module (F) (see figure 2-8 on page 2-17).
- b. Select Skin Mode.
- c. Disconnect the skin probe from the **1** skin connector on the sensor module (F).

The alarm sounds, the **Skin Temperature** display goes blank (--.), and the message **Skin Probe Disconnect** appears.

Yes	No
↓	→ Go to RAP 2.38 on page 2-102.

33. Perform the following to check the maximum air temperature.

- a. Press the **Silence/Reset** key to silence the **Skin Probe Disconnect** alarm for 5 minutes.
- b. Connect a skin probe to the **1** skin connector on the sensor module (F) to return the unit to normal operation.
- c. If necessary, select Skin Mode.
- d. Select a skin temperature setpoint of greater than 99°F (37°C).

- e. Place the skin probe outside of the incubator.
- f. Allow the incubator to heat.
- g. When the **Skin Temperature** alarm sounds, press the **Silence/Reset** key.

The incubator's temperature stays below 102.0°F (38.9°C), as indicated by the **Air Temperature** display.

Yes No



→ Go to RAP 2.39 on page 2-103.

34. The incubator is equipped with a scale assembly.

Yes No



→ Go to step 38.

35. Perform the following to check the operation of the scale assembly:

- a. Ensure that the mattress tray is level and **not** in Trendelenburg or Reverse Trendelenburg.
- b. If you desire a pounds/ounces display, refer to "Installation and Set-up" on page 6-13.
- c. Remove any objects from the mattress.
- d. Select **Display 2**, and press the **Weigh** softkey.
- e. Press the **Zero** softkey twice in succession.

The **Weight** display reads **0**, and the **Weight Sample** bar begins to fill.

Yes No



→ Go to RAP 2.47 on page 2-114.

36. Place a weight of known value less than 15 lb (7 kg) on the mattress. The correct weight appears, and when the **Weight Sample** bar is filled, a beep sounds and the weight is locked into the **Weight** display.

Yes No



→ Go to RAP 2.47 on page 2-114.

37. Perform the following:

- a. Press the **Home** key to return to **Display 2**.
- b. Press the **Weigh** softkey.

The display again displays the value of the weight on the mattress.

Yes No



→ Go to RAP 2.47 on page 2-114.

38. If necessary, remove the weight from the mattress, and press the **Home** softkey. The incubator is equipped with an oxygen system accessory.

Yes **No**
↓ → Go to step 43.

39. Perform the following to check the operation of the oxygen system accessory:

- a. Place a calibrated oxygen analyzer inside the hood assembly at 4" (10 cm) above the center mattress.
- b. At **Display 1**, press the **Oxygen** softkey.
- c. Turn on **Oxygen** control.
- d. Set the oxygen setpoint to 45%.

Within 5 minutes, the oxygen analyzer and the **Oxygen** display both read **45% ± 5%**.

Yes **No**
↓ → Go to step 41.

40. Go to step 43.

41. The oxygen concentration level is **lower** than **50%** to **70%**.

Yes **No**
↓ → The oxygen concentration level is **higher** than **50%** to **70%**.
Go to RAP 2.5 on page 2-56.

42. Go to RAP 2.4 on page 2-54.

43. The incubator is equipped with a humidity system accessory.

Yes **No**
↓ → Go to "Final Actions" on page 2-22.

44. Perform the following to check the operation of the humidity system accessory:



CAUTION:

To avoid equipment damage, use **only** distilled or sterile distilled water. Sterile water alone is **not** an acceptable substitute for distilled water.

- a. Fill the humidity reservoir with distilled water **only**.
- b. Place the probe of a calibrated hygrometer inside the hood assembly at 4" (10 cm) above the center mattress.
- c. If necessary, select Air Mode.
- d. Pre-warm the incubator to 95°F (35°C).
- e. At **Display 1**, press the **Humidity** softkey to turn on the humidity.
- f. Set the humidity setpoint to **50%**.

NOTE:

The humidity system sensor has a tolerance of $\pm 6\%$ relative humidity (RH). Some hygrometers have an additional tolerance of $\pm 3\%$ RH. When using a hygrometer to determine the performance of the humidity system, allow for a total of $\pm 6\%$ RH, plus the hygrometer tolerance.

Within 30 to 60 minutes, the hygrometer and **Humidity** display both read **50% \pm 6%**.

Yes No



→ Go to RAP 2.40 on page 2-104.

45. Go to "Final Actions" on page 2-22.

Final Actions

1. Complete the required preventive maintenance procedures. See "Preventive Maintenance Checklist" on page 6-12.
2. Complete all required administrative tasks.

Alarms

High and Low Air and Skin Temperature Alarms

The high and low air or skin temperature alarms activate if the skin or air temperature fluctuates from the set temperature as follows:

- Skin temperature— $\pm 1.0^{\circ}\text{C}$
- Air temperature— $+1.5^{\circ}\text{C}$, -2.5°C

NOTE:

The skin temperature limits may also be set to $\pm 0.5^{\circ}\text{C}$. Refer to “Installation and Set-up” on page 6-13.

A temperature below the air or skin set temperature is indicated by the message **Low Air Temperature** or **Low Skin Temperature** in the message center, an audible alarm, flashing indicators, and a low temperature reading. A temperature above the air or skin set temperature is indicated by the message **High Air Temperature** or **High Skin Temperature** in the message center, an audible tone, flashing indicators, and a high temperature reading.

The high and low air or skin temperature alarms are self-resetting; that is, if the alarm condition is corrected, the alarm automatically silences and the **Alarm** indicators turn off. To silence the audible portion of the **High** and **Low Air** or **Skin Temperature** alarms, press the **Silence/Reset** key; the activation of other audible and visual alarms are not affected by use of the 15-minute audible alarm silence. When the alarm silences, the **Alarm** indicators remain on until the alarm condition is corrected. If the alarm condition is not corrected within 15 minutes, the alarm sounds.

In addition, if the air or skin set temperature changes (either high or low) after the incubator is in operation, the **High Temperature** and **Low Temperature** alarms automatically silence for a specific amount of time after the operator raises or lowers the air or skin set temperature from the current temperature. As a general rule, the greater the change from the current incubator temperature, the longer the alarm remains silent. If the incubator fails to reach the new set temperature after the specified time, the alarm sounds.

Alternately, before changing the current air or skin set temperature, the operator may press the **Silence/Reset** key to place the unit in Procedural Silence Mode. In Procedural Silence Mode, the **Low Temperature** alarm silences for up to 15 minutes. If a **High Temperature**, **Airflow**, or **Probe** alarm occurs, Procedural Silence Mode terminates.

Alarm and System Prompt Messages

During an alarm condition or procedure, alarm and system prompt messages replace the **Trend** display or the **Oxygen** and **Humidity** displays. If two or more alarms occur simultaneously, or one after the other, the messages that describe the alarms appear in sequence. A total of six messages can post.

For an explanation of system alarms, refer to table 2-1 on page 2-25. For more information, refer to “System Failure Messages” on page 2-31.

Table 2-1. System Alarms

Alarm	Description	Action
Power Failure	The Alarm indicator flashes and an alarm beeps to indicate that primary power to the incubator failed, or the power cord is unplugged from its power source.	Go to RAP 2.41 on page 2-106.
Motor Failure	The Alarm indicator flashes and a continuous alarm sounds to indicate a motor malfunction.	Go to RAP 2.20 on page 2-75.
Heater Failure 1 And 2	The Alarm indicator flashes and a continuous alarm sounds to indicate a heater malfunction.	Go to RAP 2.18 on page 2-72.
Controller Failure 1 Through 17	The Alarm indicator flashes and a continuous alarm sounds to indicate an internal malfunction.	Go to “System Failure Messages” on page 2-31.
Key Stuck	The Alarm indicator flashes and a continuous alarm sounds to indicate a controller key malfunction.	Go to RAP 2.23 on page 2-79.
Air Probe Failure	The Alarm indicator flashes and a continuous alarm sounds to indicate an air probe malfunction.	Go to RAP 2.8 on page 2-62.
Low Airflow	The Alarm indicator flashes and a continuous alarm sounds to indicate a lack of air circulation within the incubator.	Go to RAP 2.44 on page 2-111.
Sensor Module Failure	The Alarm indicator flashes and a continuous alarm sounds to indicate a sensor module malfunction or that it is not connected to the incubator.	Go to RAP 2.45 on page 2-112.
Sensor Out Of Position	The Alarm indicator flashes and a continuous alarm sounds to indicate that the sensor module is not in the correct position to perform calibration or continue operation.	Go to RAP 2.22 on page 2-78.
Sensor Disconnected	The Alarm indicator flashes and a continuous alarm sounds to indicate that the sensor module experienced a communications failure.	Go to RAP 2.21 on page 2-76.

For an explanation of temperature alarms, refer to table 2-2 on page 2-26.

Table 2-2. Temperature Alarms

Alarm	Description	Action
Low Air Temperature	The alarm message appears, an alarm sounds, and the Alarm indicators flash to indicate that the incubator air temperature is 2.5°C below the air set temperature.	Go to RAP 2.35 on page 2-99.
High Air Temperature	The alarm message appears, an alarm sounds, and the Alarm indicators flash to indicate that the incubator air temperature is 1.5°C above the air set temperature.	Go to RAP 2.39 on page 2-103.
Skin Mode Disabled	The alarm message appears, an alarm sounds, and the Alarm indicators flash to indicate that Skin Mode is disabled.	To activate Skin Mode, press the Skin softkey.
Low Skin Temperature	The alarm message appears, an alarm sounds, and the Alarm indicators flash to indicate that the Skin 1 Probe reports that the baby's skin temperature is 1°F (or 0.5°C) below the skin set temperature.	Go to RAP 2.3 on page 2-52.
High Skin Temperature High Skin 1 Temperature	The alarm message appears, an alarm sounds, and the Alarm indicators flash to indicate that Skin 1 Probe reports that the baby's skin temperature is 1°F (or 0.5°C) above the skin set temperature.	Go to RAP 2.39 on page 2-103.
High Temperature Cut Out	The alarm message appears, an alarm sounds, and the steady Alarm indicators illuminate to indicate that incubator air temperature has reached 99.5°F (37.5°C) ± 0.5°C for set temperatures up to 98.6°F (37.0°C) and 103.1°F (39.5°C) for set temperatures greater than 98.6°F (37.0°C).	Go to RAP 2.39 on page 2-103.
Remove Skin 2 Probe	The alarm message appears, an alarm sounds, and the Alarm indicators flash to indicate one of the following: <ul style="list-style-type: none"> A second skin probe is connected to the sensor module during Skin Mode. A second skin probe is connected to the sensor module during Air Mode, and an attempt to enter Skin Mode was made. 	Go to RAP 2.46 on page 2-113.

Alarm	Description	Action
Skin 1 Probe Failure	The alarm message appears, an alarm sounds, and the Alarm indicators flash to indicate that the Skin 1 Probe malfunctioned. To silence this alarm for 5 min, press the Silence/Reset key.	Go to RAP 2.42 on page 2-107.
Skin Probe Disconnect	The alarm message appears, an alarm sounds, and the Alarm indicators flash to indicate that Skin 1 Probe is disconnected from the sensor module during Skin Mode.	Go to RAP 2.42 on page 2-107.
Connect Skin 1 Probe	The alarm message appears, an alarm sounds, and the Alarm indicators flash to indicate that the Skin 1 Probe was disconnected from the sensor module during Air Mode and an attempt has been made to enter Skin Mode.	Go to RAP 2.42 on page 2-107.

For an explanation of humidity alarms, refer to table 2-3 on page 2-27.

Table 2-3. Humidity Alarms

Alarm	Description	Action
Low Humidity	The alarm message appears with an audible alarm and flashing alarm indicator to indicate that the humidity tray is empty.	Go to RAP 2.40 on page 2-104.
Humidity Heater Failure	The alarm message appears to inform the user that the humidity system malfunctioned.	Go to RAP 2.40 on page 2-104.

For an explanation of oxygen alarms, refer to table 2-4 on page 2-28.

Table 2-4. Oxygen Alarms

Alarm	Description	Action
Low Oxygen %	The alarm message appears, an alarm sounds, and the Alarm indicators flash to indicate that the oxygen concentration within the hood environment is below the oxygen setpoint.	Go to RAP 2.4 on page 2-54.
High Oxygen %	The alarm message appears, an alarm sounds, and the Alarm indicators flash to indicate that the oxygen concentration within the hood environment is above the oxygen setpoint.	Go to RAP 2.5 on page 2-56.
Oxygen Calibration Required	The alarm message appears, an alarm sounds, and the Alarm indicators flash to indicate that the oxygen control system requires calibration.	Go to RAP 2.43 on page 2-110.
Oxygen Cell Different	The alarm message appears, an alarm sounds, and the Alarm indicators flash to indicate that the oxygen cell readings differ by greater than 3%.	Go to RAP 2.43 on page 2-110.
Oxygen Solenoid Fail	This message informs the user that the oxygen solenoid has failed.	Go to RAP 2.43 on page 2-110.

For an explanation of weighing scale alarms, refer to table 2-5 on page 2-28.

Table 2-5. Weighing Scale Alarms

Alarm	Description	Action
Too Much Weight	The alarm message appears with an audible alarm and flashing alarm indicators to indicate that the weight on the mattress is in excess of 15 lb (7 kg), or when zeroing, this message appears if a weight in excess of 2 lb (1 kg), or with software version 2.05 or higher, 7.7 lb (3.5 kg) is on the mattress.	Go to RAP 2.47 on page 2-114.
Scale Disconnected	The alarm message appears if the cable between the scale and the sensor module is disconnected.	Go to RAP 2.47 on page 2-114.
Clear Mattress	The alarm message appears if extraneous objects are on the mattress.	Go to RAP 2.47 on page 2-114.

For an explanation of system prompt messages, refer to table 2-6 on page 2-29.

Table 2-6. System Prompt Messages

Prompt Message	Description	Action
Power-On Test in Progress	This message indicates that the controller is performing the power-up test.	No action required.
21% Cal	This message indicates that the oxygen control system is performing the 21% calibration procedure.	No action required.
100% Cal	This message indicates that the oxygen control system is performing the 100% calibration procedure.	No action required.
Cal Pass	This message indicates that the oxygen control system is successfully calibrated.	No action required.
Cal Fail	This message indicates that the oxygen control system has failed to calibrate.	Go to RAP 2.48 on page 2-117.
Procedural Silence	This message indicates that the 5-minute Procedural Silence is active. During this time, Low Skin/Air Temperature alarms automatically silence for 15 minutes, and the Low Oxygen % alarm automatically silences for 4 minutes.	No action required.
Not Installed	This message informs the user that the humidity or oxygen systems are not activated or installed.	Install the humidity system (refer to procedure 7.3 on page 7-14). or Install the oxygen system (refer to procedure 7.2 on page 7-8).
Slide Out Sensor	This message advises the user to withdraw the sensor module from the hood during 21% oxygen calibration.	Withdraw the sensor module assembly from the hood.
Slide In Sensor	This message advises the user to return the sensor module inside the hood during 21% oxygen calibration.	Slide the sensor module assembly into the hood.
Zeroing Failed	This message informs the user that the weight is greater than 7.7 lb (3.5 kg) on the mattress during infant ZERO .	Go to RAP 2.47 on page 2-114.

For an explanation of **Silence/Reset** key functions, refer to table 2-7 on page 2-30.

Table 2-7. Silence/Reset Key Functions

Alarm	Silence/Reset Key Function
Low Air/Skin Temperature	Silence the alarm for a period of 15 minutes.
High Air/Skin Temperature	Silence the alarm for a period of 15 minutes.
Humidity Low	Silence the alarm for a period of 15 minutes.
Power Failure	Silence the alarm for a period of 15 minutes.
Skin 1 Probe Failure	Silence the alarm for a period of 5 minutes.
Skin Probe Disconnect	Silence the alarm for a period of 5 minutes.
High Temperature Cut Out	Silence the alarm for a period of 5 minutes.
Oxygen High %	Silence the alarm for a period of 4 minutes.
Oxygen Low %	Silence the alarm for a period of 4 minutes.
Oxygen Calibration Required	Silence the alarm for a period of 4 minutes.
Oxygen Cell Different	Silence the alarm for a period of 4 minutes.
High Temperature Cut Out	Resets the alarm, or cancels the alarm if the alarm condition no longer exists.
Sensor Module Failure	Resets the alarm, or cancels the alarm if the alarm condition no longer exists.
Power Fail	Resets the alarm, or cancels the alarm if the alarm condition no longer exists.

System Failure Messages

In the event of a system failure, a message appears on the controller screen. For system failure messages, their possible causes, and the appropriate action to take, refer to table 2-8 on page 2-31.

Table 2-8. System Failure Messages

Message	Cause	Action
Controller Failure 1	The EEPROM circuitry fails.	Go to RAP 2.7 on page 2-61.
Controller Failure 3	The ambient air probe fails.	Go to RAP 2.8 on page 2-62.
Controller Failure 4	The controller's cooling fan fails.	Go to RAP 2.9 on page 2-63.
Controller Failure 5	The display test fails.	Go to RAP 2.10 on page 2-64.
Controller Failure 6	The external serial port loop-back test fails.	For assistance, call Technical Support at (800) 437-2437.
Controller Failure 7	The power supply voltage fails.	Go to RAP 2.11 on page 2-65.
Controller Failure 8	The RAM test fails.	Go to RAP 2.12 on page 2-66.
Controller Failure 9	The real-time clock fails.	Go to RAP 2.13 on page 2-67.
Controller Failure 10	The watchdog timer fails.	Go to RAP 2.14 on page 2-68.
Controller Failure 11	The relay test fails.	Go to RAP 2.15 on page 2-69.
Controller Failure 13	A heater circuit failure is detected after all relays are off for 5 seconds, or the currents exceed the maximum limits during power-up.	Go to RAP 2.16 on page 2-70.
Controller Failure 14	A low heater current is detected.	Go to RAP 2.17 on page 2-71.
Controller Failure 15	The non-volatile RAM contains an invalid parameter.	Go to RAP 2.49 on page 2-118.

Message	Cause	Action
Controller Failure 16	The non-volatile RAM integrity fails.	Go to RAP 2.50 on page 2-119.
Controller Failure 17	The non-volatile RAM parameter consistency check fails.	Go to RAP 2.51 on page 2-120.
Heater Failed 1	The heater thermocouple voltage exceeds ± 40 mV.	Go to RAP 2.18 on page 2-72.
Heater Failed 2	The heater thermocouple wires are open or shorted.	Go to RAP 2.18 on page 2-72.
Humidity Heater Failure	The humidity heater draws too much current.	Go to RAP 2.19 on page 2-74.
Motor Failed	For software version 2.06, the fan motor speed exceeds ± 450 rpm; for previous software versions, the fan motor speed exceeds ± 200 rpm.	Go to RAP 2.20 on page 2-75.
Sensor Disconnect	Communications fail between the sensor module and the controller.	Go to RAP 2.21 on page 2-76.
Sensor Out of Position	The sensor module is not in the hood or the calibration position.	Go to RAP 2.22 on page 2-78.
Stuck Key	A stuck key is detected.	Go to RAP 2.23 on page 2-79.
Check Settings	The non-volatile memory (NVM) integrity test fails.	Go to RAP 2.24 on page 2-80.

Diagnostic Menus

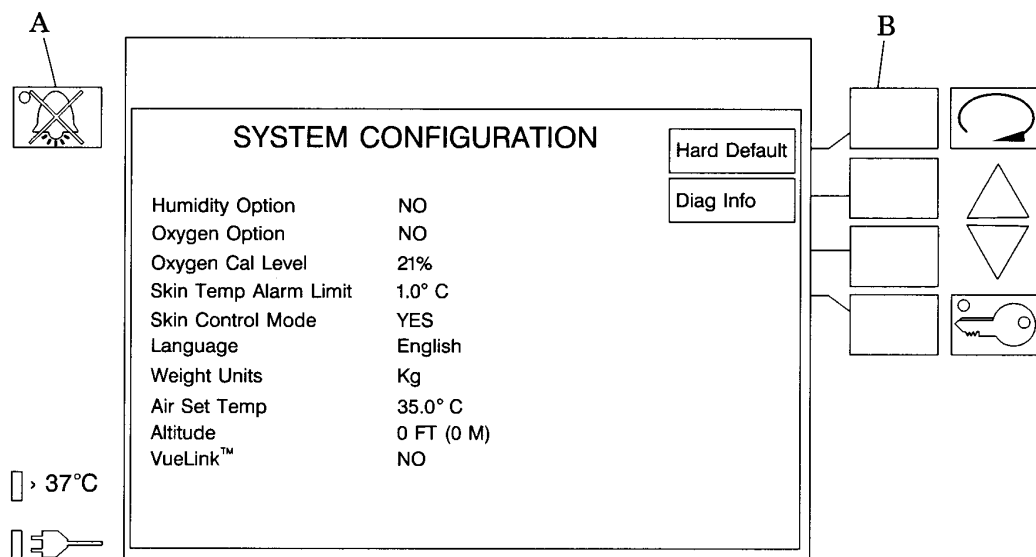
To aid in troubleshooting, the Isolette® Infant Incubator has a series of diagnostic menus. Perform one of the following:

- To access the **System Configuration** menu, refer to “Entering the System Configuration Menu” on page 2-33.
- To access the **Diagnostic Info** menu without first powering the unit down and accessing the **System Configuration** menu, refer to “Entering the Diagnostic Information Menu” on page 2-35.

Entering the System Configuration Menu

1. Turn off the controller’s **Power** switch, and then press the **Silence/Reset** key (A) while simultaneously turning on the controller power switch. The **System Configuration** menu appears (see figure 2-9 on page 2-33).

Figure 2-9. System Configuration Menu



m223ge101

2. After viewing the current settings, perform one of the following:
 - Return the **System Configuration** menu to the original settings as shown in table 2-9 on page 2-34 by pressing the **Hard Default** key (B).
 - View the **Diagnostic Information** menu by pressing the **Diag Info** key (C). Go to “Entering the Diagnostic Information Menu” on page 2-35.
 - Enter the desired system configuration settings, and press the **Silence/Reset** key (A) to return to **Display 1**.

Table 2-9. System Configuration Factory Default Settings

Feature	Setting
Air Mode	ON
Skin Mode	ON
Air set temperature	95.0°F (35.0°C)
Skin set temperature	97.7°F (36.5°C)
Humidity control mode	OFF
Humidity set value	50% RH
Oxygen control mode	OFF
Oxygen calibration level	21%
Temperature units	°C
Weight units	Kg
Trend	Air, 2 hours
Language	English
Altitude	< 0' (0 m)
VueLink™ ^a	OFF

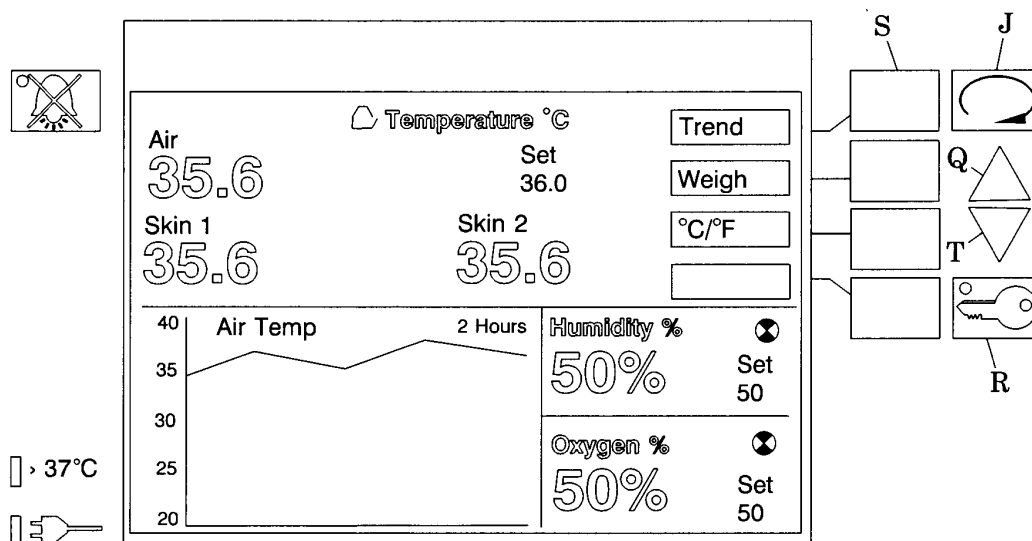
a. VueLink™ is a trademark of Philips Medical Systems.

Entering the Diagnostic Information Menu

To access the **Diagnostic Info** menu **without** turning the unit off, perform the following:

1. Ensure that the keypad is unlocked. If necessary, press the **Keypad Lock** key (R) to unlock the keypad (see figure 2-10 on page 2-35).

Figure 2-10. Trend Display

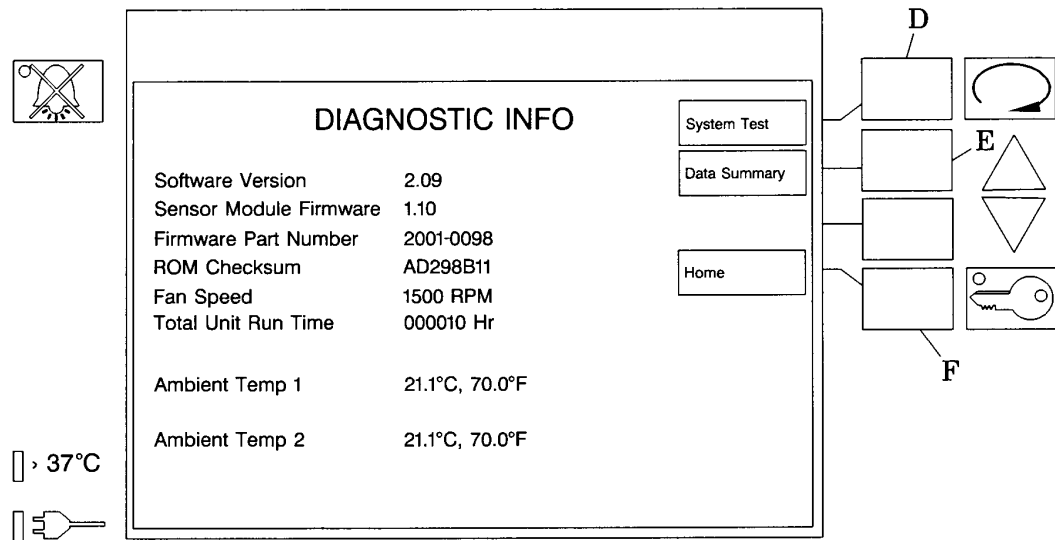


m223g208

2. Press the **Display Selection** key (J). The **Trend** display appears.
3. Press the **Trend** key (S).
4. Press the **Up** arrow key (Q).
5. Press the **Keypad Lock** key (R).
6. Press the **Down** arrow key (T).

7. Press the **Display Selection** key (J). The **Diagnostic Info** menu appears (see figure 2-11 on page 2-36).

Figure 2-11. Diagnostic Information Menu



m223ge102

For a description of the information listed on the **Diagnostic Info** menu, refer to table 2-10 on page 2-37.

Table 2-10. Diagnostic Information Menu

Information Item	Description
Software version	This displays the current version of the controller software.
Sensor module firmware	This displays the current version of the sensor module firmware.
Firmware part number	This displays the identification number of the controller firmware.
ROM checksum	This verifies the operation of the controller software.
Fan speed	This displays the current impeller speed.
Total unit run time	This displays the total time the controller has been powered on.
Ambient temp 1	This displays the current ambient temperature probe 1 reading.
Ambient temp 2	This displays the current ambient temperature probe 2 reading.

After viewing the current diagnostic information, perform one of the following:

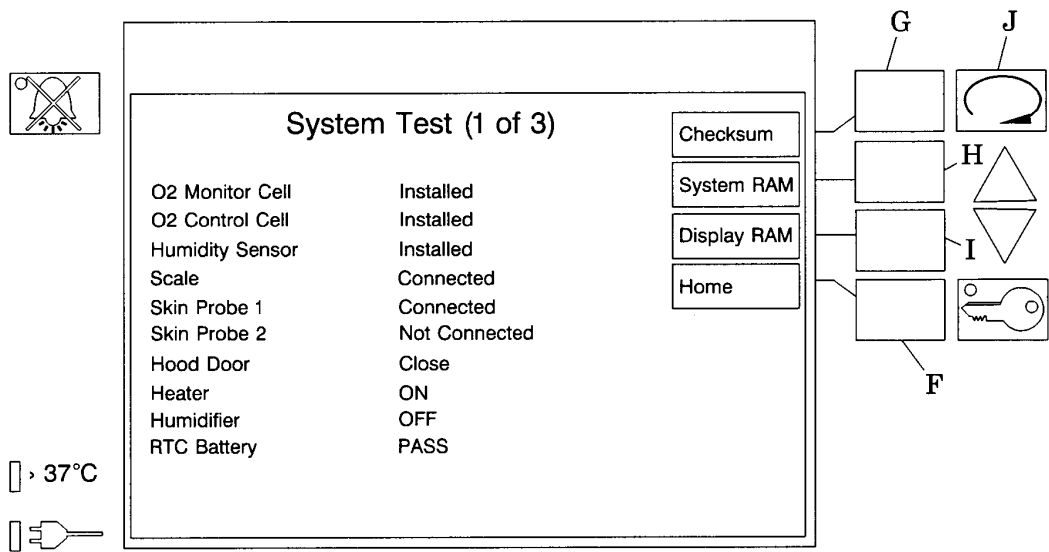
- View the **System Test (1 of 3)** screen by pressing the **System Test** key (D). Go to “System Test Menu” on page 2-38.
- View the **Data Summary** screen by pressing the **Data Summary** key (E). Go to “Data Summary Menu” on page 2-44.
- Return to **Display 1** by pressing the **Home** key (F).

System Test Menu

System Test (1 of 3) Menu

For a description of the information listed on the **System Test (1 of 3)** menu, refer to table 2-11 on page 2-39 (see figure 2-12 on page 2-38).

Figure 2-12. System Test (1 of 3) Menu



m223g109

Table 2-11. System Test (1 of 3) Menu

Information Item	Description
O ₂ monitor cell	This displays the installation status of the oxygen monitor fuel cell.
O ₂ control cell	This displays the installation status of the oxygen control cell.
Humidity sensor	This displays the installation status of the humidity sensor.
Scale	This displays the connection status of the scale assembly.
Skin probe 1	This displays the connection status of the skin temperature probe 1.
Skin probe 2	This displays the connection status of the skin temperature probe 2.
Hood door	This displays the open/closed status of the front or back access panel assembly.
Heater	This displays the on/off status of the unit's heater.
Humidifier	This displays the on/off of the humidity evaporator assembly.
RTC battery	This displays the pass/fail status of the real-time clock (RTC) battery.

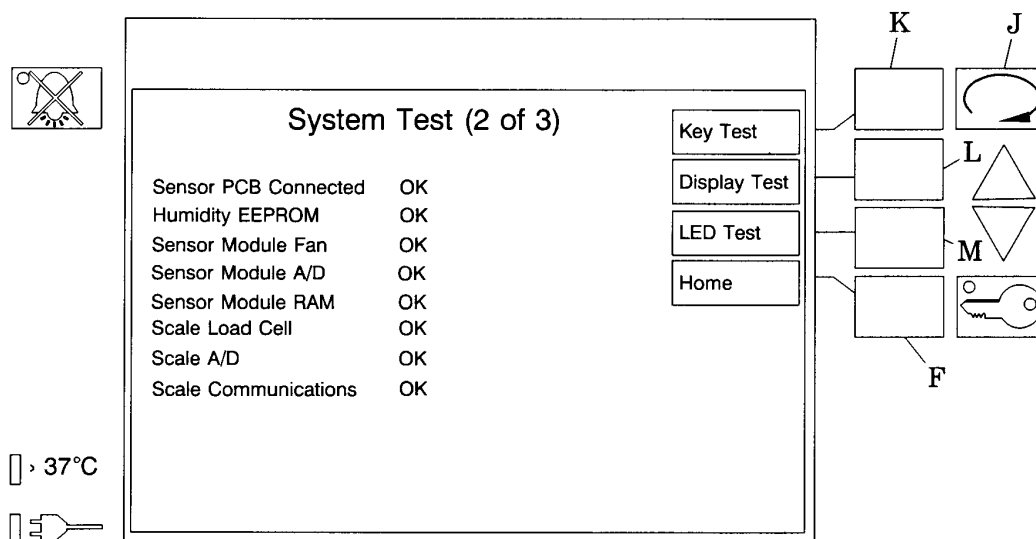
After viewing the current system test results, perform one of the following:

- Check the system checksum by pressing the **Checksum** key (G).
- Check the system RAM by pressing the **System RAM** key (H).
- Check the display RAM by pressing the **Display RAM** key (I).
- View the **System Test (2 of 3)** screen by pressing the **Display Selection** key (J). Go to “System Test (2 of 3) Menu” on page 2-40.
- Return to the **Diagnostic Info** menu by pressing the **Home** key (F). Go to “Entering the System Configuration Menu” on page 2-33.

System Test (2 of 3) Menu

The **System Test (2 of 3)** menu displays the OK/fail results of the microprocessor's verification of the operation of the following components (see figure 2-13 on page 2-40):

Figure 2-13. System Test Menu (2 of 3)



m223g110

- The sensor module P.C. board
- The humidity EEPROM
- The sensor module fan
- The sensor module analog/digital (A/D) converter
- The sensor module random access memory (RAM)
- The scale load cell
- The scale A/D converter
- The scale's communication to the unit

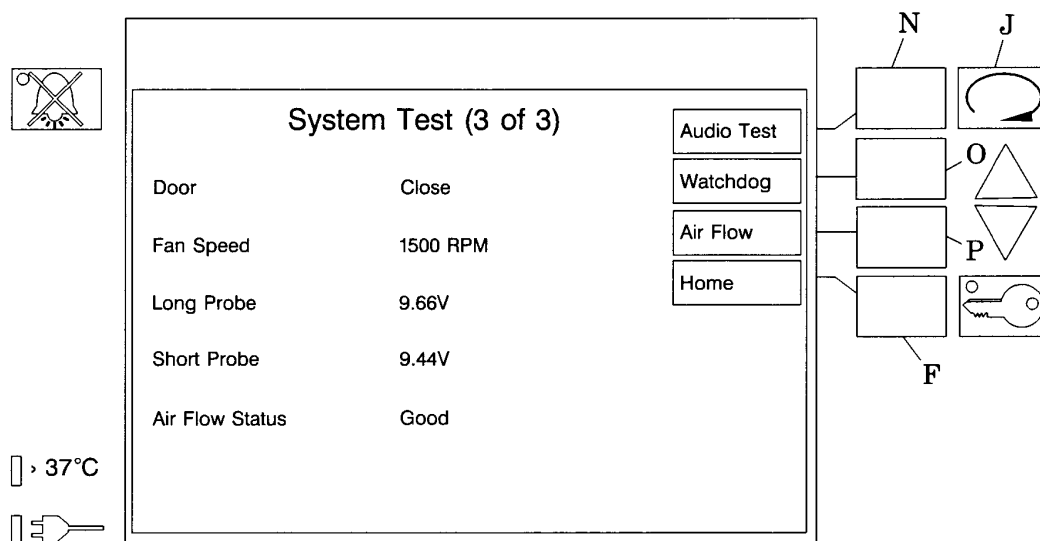
Perform one of the following:

- View the key check display by pressing the **Key Test** key (K). Go to “Key Check Display” on page 2-43.
- Light all segments of the display by pressing the **Display Test** key (L).
- Initiate the LED test by pressing the **LED Test** key (M). All LEDs light in succession.
- Call up the **System Test (3 of 3)** screen by pressing the **Display Selection** key (J). Go to “System Test (3 of 3) Menu” on page 2-41.
- Return to the **Diagnostic** menu by pressing the **Home** key (F). Go to “Entering the System Configuration Menu” on page 2-33.

System Test (3 of 3) Menu

For a description of the information listed on the **System Test (3 of 3)** menu, refer to table 2-12 on page 2-42 (see figure 2-14 on page 2-41).

Figure 2-14. System Test (3 of 3) Menu



m223g111

Table 2-12. System Test (3 of 3) Menu

Information Item	Description
Door	This displays the open/closed status of the front or back access panel.
Fan speed	This displays the current impeller speed.
Long probe	This displays information no longer applicable to the operation of the unit.
Short probe	This displays information no longer applicable to the operation of the unit.
Air flow status	This displays the status of the impeller movement detection (IMD) P.C. board.

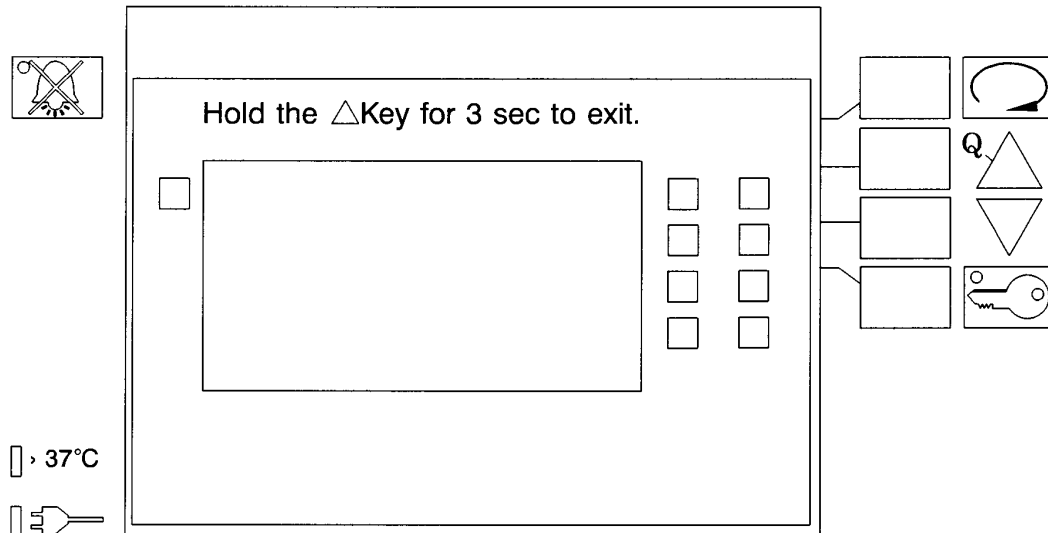
Perform one of the following:

- Initiate the audio test by pressing the **Audio Test** key (N).
- Test the watchdog by pressing the **Watchdog** key (O).
- Test the airflow by pressing the **Airflow** key (P).
- To view the **System Test (1 of 3)** screen, press the **Display Selection** key (J). Go to “System Test (1 of 3) Menu” on page 2-38.
- Return to the **Diagnostic** menu by pressing the **Home** key (F). Go to “Entering the System Configuration Menu” on page 2-33.

Key Check Display

Perform the following to test the keys at the Key Check display (see figure 2-15 on page 2-43):

Figure 2-15. Key Check Display



m223g112

1. Press each key in succession. Each key's respective box lights.

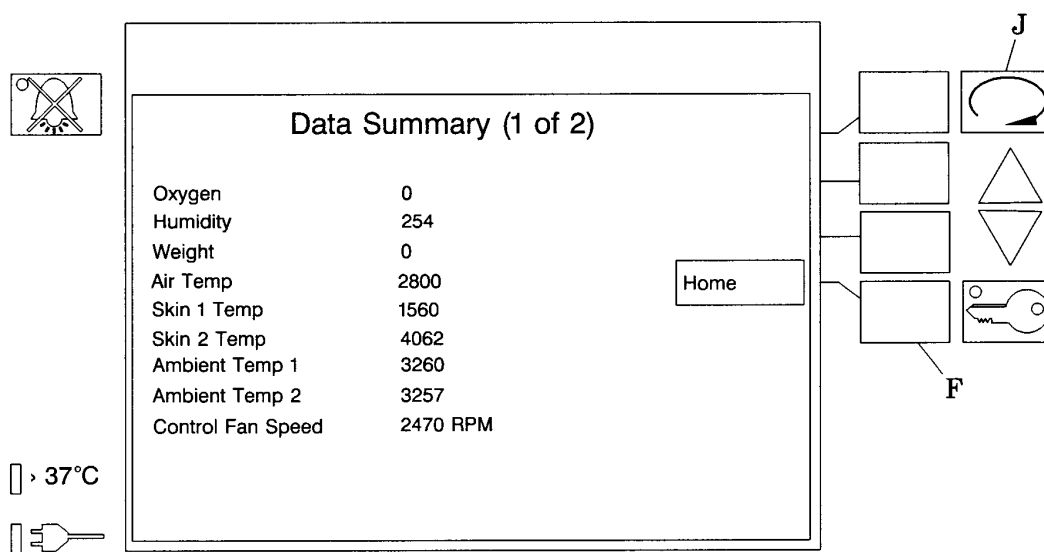
Yes	No
↓	→ Go to RAP 2.23 on page 2-79.
2. Exit the Key Check display by pressing the **Up** arrow key (Q) for 3 seconds.

Data Summary Menu

Data Summary (1 of 2) Menu

For a description of the information listed on the **Data Summary (1 of 2)** menu, refer to table 2-13 on page 2-45 (see figure 2-16 on page 2-44).

Figure 2-16. Data Summary (1 of 2) Menu



m223g113

Table 2-13. Data Summary (1 of 2) Menu

Information Item	Description
Oxygen	This displays the current data used by the microprocessor to figure the oxygen reading.
Humidity	This displays the current data used by the microprocessor to figure the humidity reading.
Weight	This displays the current data used by the microprocessor to figure the weight reading.
Air temp	This displays the current data used by the microprocessor to figure the air temperature reading.
Skin 1 temp	This displays the current data used by the microprocessor to figure the skin temperature probe 1 reading.
Skin 2 temp	This displays the current data used by the microprocessor to figure the skin temperature probe 2 reading.
Ambient temp 1	This displays the current data used by the microprocessor to figure the ambient temperature probe 1 reading.
Ambient temp 2	This displays the current data used by the microprocessor to figure the ambient temperature probe 2 reading.
Control fan speed	This displays the current controller cooling fan speed.

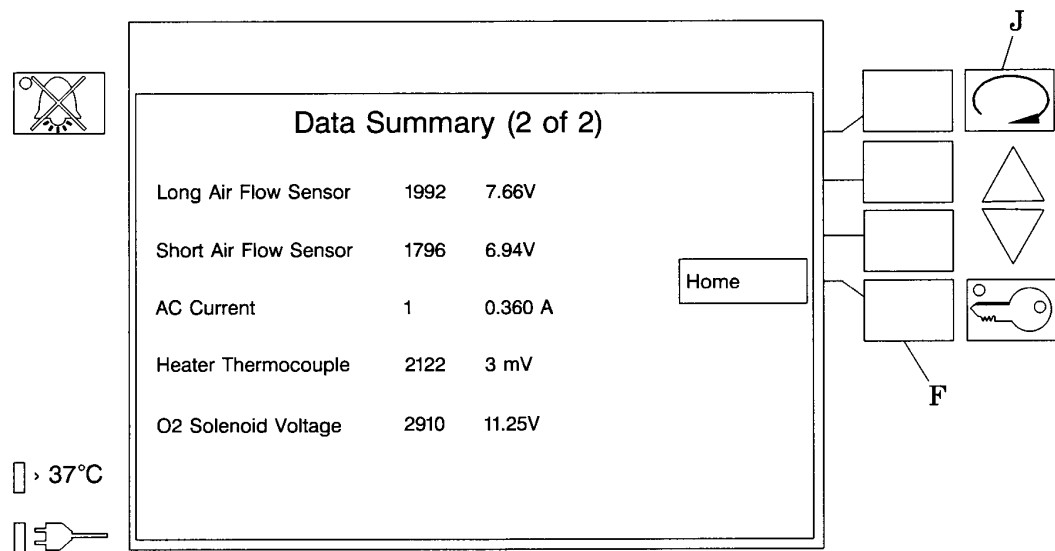
Perform one of the following:

- Return to the **Diagnostic Info** menu by pressing the **Home** key (F). Go to “Entering the System Configuration Menu” on page 2-33.
- View the **Data Summary (2 of 2)** screen by pressing the **Display Selection** key (J). Go to “Data Summary (2 of 2) Menu” on page 2-46.

Data Summary (2 of 2) Menu

For a description of the information listed on the **Data Summary (2 of 2)** menu, refer to table 2-13 on page 2-45 (see figure 2-17 on page 2-46).

Figure 2-17. Data Summary Screen (2 of 2)



m223g114

Table 2-14. Data Summary (2 of 2) Menu

Information Item	Description
Long air flow sensor	This displays information no longer applicable to the operation of the unit.
Short air flow sensor	This displays information no longer applicable to the operation of the unit.
AC current	This displays the instantaneous power consumption of the unit.
Heater thermocouple	This displays the current status of the heater.
O ₂ solenoid voltage	This displays the current voltage present on the oxygen solenoid.

Perform one of the following:

- Return to the **Diagnostic Info** menu by pressing the **Home** key (F). Go to “Entering the System Configuration Menu” on page 2-33.
- View the **Data Summary (1 of 2)** screen by pressing the **Display Selection** key (J). Go to “Data Summary (1 of 2) Menu” on page 2-44.

NOTES:

2.1 There Is No Power, and *Power Failure* Alarm Does Not Activate

1. The **Power** switch is in the **On** position.

Yes **No**



→ Press the **Power** switch. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, call Technical Support at (800) 437-2437 for assistance.

2. For assistance, call Technical Support at (800) 437-2437.

2.2 Variable Height Adjustable (VHA) Pedestal/Stand Does Not Move Up or Down

1. Check the variable height adjustable (VHA) pedestal stand:
 - a. Turn on the main **Power** switch (A) (see figure 2-18 on page 2-51).
 - b. Use your foot to press the **Up** arrow of the up/down switch (B) to raise the VHA pedestal/stand to its maximum height.
 - c. Press and hold the **Down** arrow of the up/down switch (B) to lower the VHA pedestal/stand to its minimum height.
 - d. Repeat using the rear up/down switch (B).

The problem still exists.

Yes No

↓ → Go to “Final Actions” on page 2-22.

2. Inspect the main **Power** switch (A). The main power switch (A) is in the **On** position.

Yes No

↓ → Turn on the main **Power** switch (A). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 3.

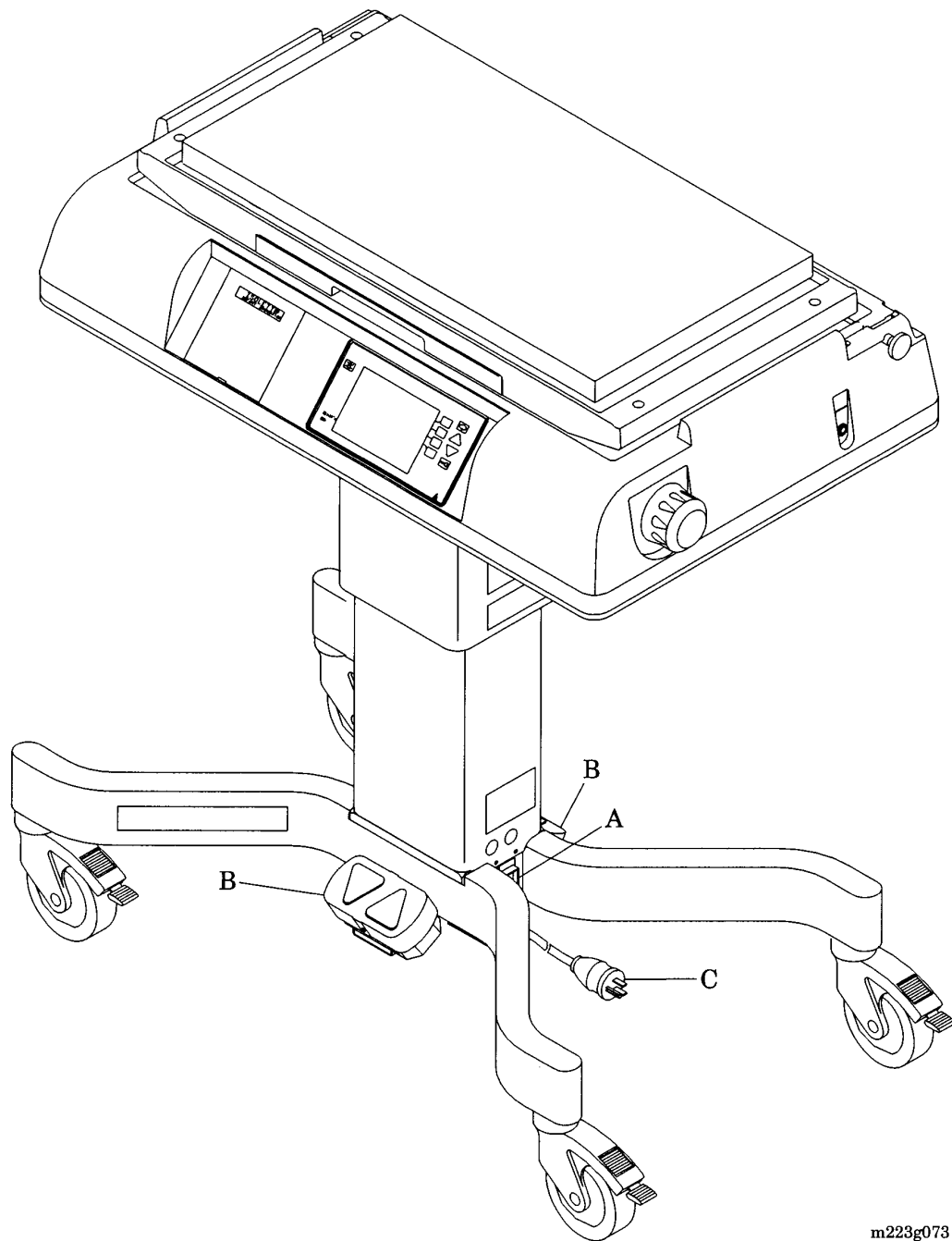
3. Inspect the power cord (C). The unit is plugged into an appropriate power source.

Yes No

↓ → Plug the unit into an appropriate power source. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, call Technical Support at (800) 437-2437 for assistance.

4. Call Technical Support at (800) 437-2437 for assistance.

Figure 2-18. Variable Height Adjustable Pedestal/Stand



m223g073

2.3 Skin Set Temperature Cannot Be Achieved or Maintained

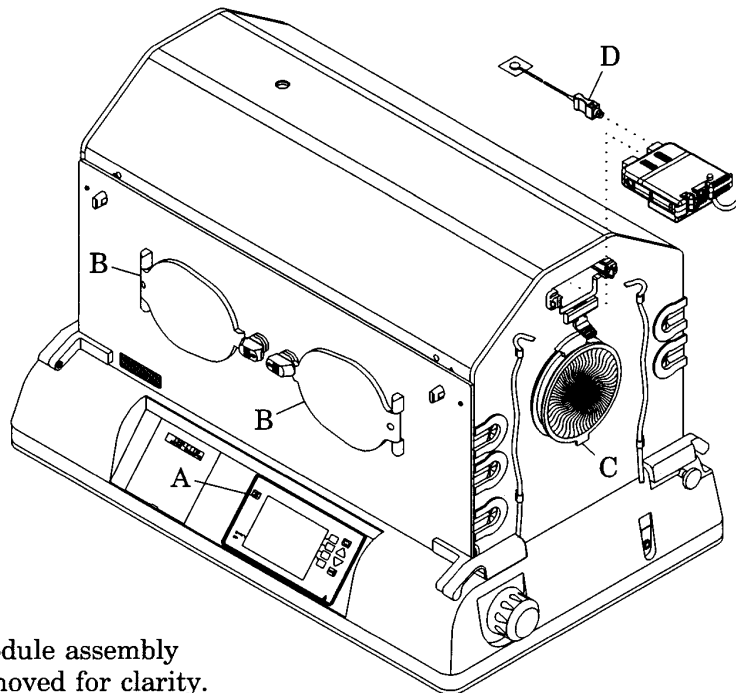
1. The **Low Skin Temperature** alarm sounds.

Yes	No
↓	→ Go to RAP 2.37 on page 2-101.

2. Perform the following:

- a. Silence the **Low Skin Temperature** alarm for 15 minutes by pressing the **Silence/Reset** softkey (A) (see figure 2-19 on page 2-52).

Figure 2-19. Hood/Shell Assembly



NOTE:
Sensor module assembly
shown removed for clarity.

m223g043

- b. Check all access doors (B) and iris entry ports (C).

All access doors (B) and iris entry ports (C) are closed.

Yes	No
↓	→ Close all access doors (B) and iris entry ports (C). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 3.

3. Check the unit's mode of operation. The unit is in Skin Mode.

Yes No



→ Place the unit in Skin Mode. If this solves the problem, go to "Final Actions" on page 2-22. Otherwise, go to step 4.

4. Check the skin probe (D). The skin probe (D) is properly secured to the infant's skin.

Yes No



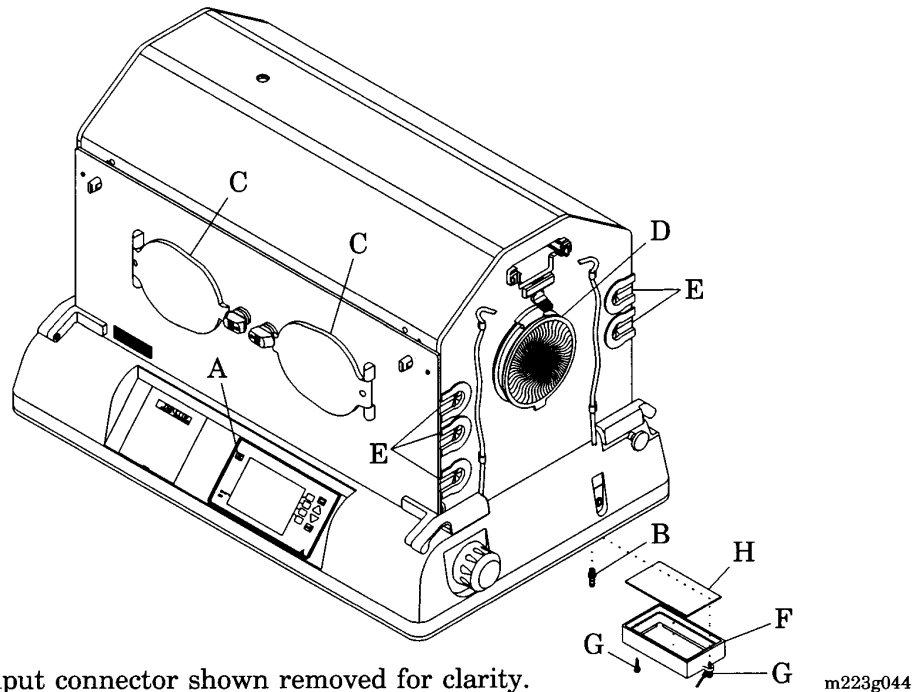
→ Properly secure the skin probe (D) to the infant's skin. If this solves the problem, go to "Final Actions" on page 2-22. Otherwise, call Technical Support at (800) 437-2437 for assistance.

5. Call Technical Support at (800) 437-2437 for assistance.

2.4 Oxygen Concentration is Low

1. Perform the following:
 - a. If the **Low Oxygen %** alarm sounds, press the **Silence/Reset** softkey (A) to silence it for 4 minutes (see figure 2-20 on page 2-54).

Figure 2-20. Hood/Shell Assembly



NOTE:
Oxygen input connector shown removed for clarity.

- b. Inspect the oxygen source.
The oxygen source is securely connected to the oxygen input connector (B).

Yes	No
↓	→ Securely connect the oxygen source to the oxygen input connector (B). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.
2. Check all access doors (C) and iris entry ports (D). All access doors (C) and iris entry ports (D) are closed.

Yes	No
↓	→ Close all access doors (C) and iris entry ports (D). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 3.

3. Check the sleeves on the iris entry ports (D). All sleeves are properly installed.

Yes	No
↓	→ Properly install the sleeves on the iris entry ports (D) (refer to procedure 4.11 on page 4-31). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 4.
4. Check the access grommets (E). The access grommets (E) are properly installed.

Yes	No
↓	→ Properly install the access grommets (E) (refer to procedure 4.34 on page 4-93). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 5.
5. Check the air intake microfilter cover (F). The air intake microfilter cover (F) is properly secured.

Yes	No
↓	→ Tighten the two thumbscrews (G) that secure the air intake microfilter cover (F) to the unit. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 6.
6. Perform the following:
 - a. Loosen the two thumbscrews (G) on the air intake microfilter cover (F).
 - b. Remove the air intake microfilter cover (F) from the unit.
 - c. Check the air intake microfilter (H).The air intake microfilter (H) is installed.

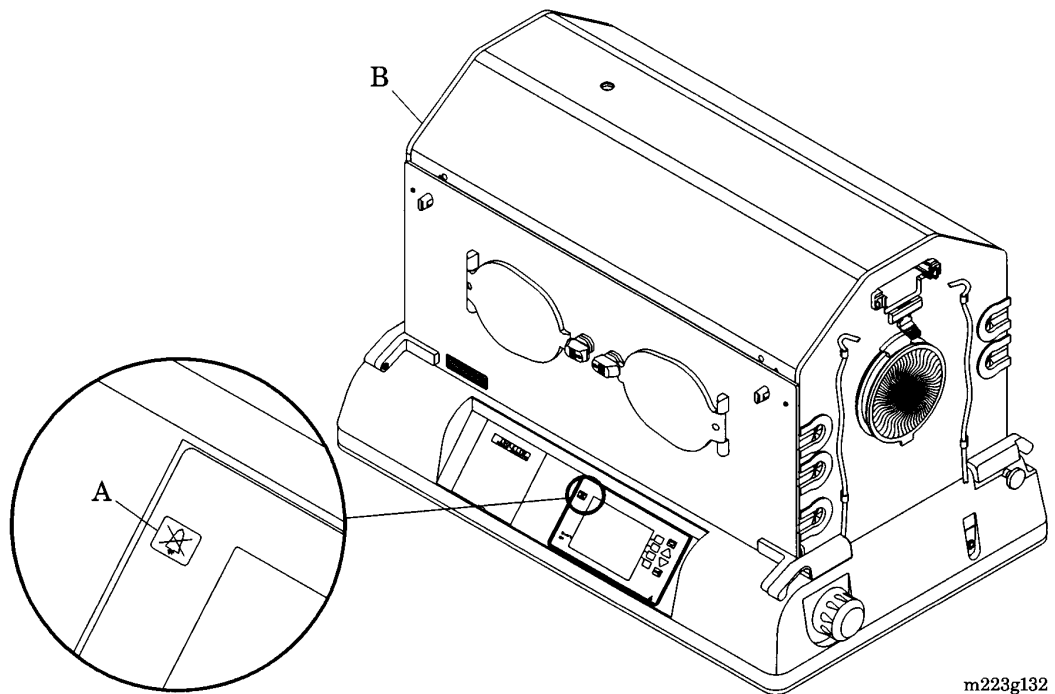
Yes	No
↓	→ Install the air intake microfilter (H) (refer to procedure 4.19 on page 4-49). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 7.
7. Go to RAP 2.31 on page 2-92. This solves the problem.

Yes	No
↓	→ For assistance, call Technical Support at (800) 437-2437.
8. Go to “Final Actions” on page 2-22.

2.5 Oxygen Concentration is High

1. Perform the following:
 - a. If the **High Oxygen %** alarm sounds, press the **Silence/Reset** softkey (A) to silence it for 4 minutes (see figure 2-21 on page 2-56).

Figure 2-21. Hood/Shell Assembly



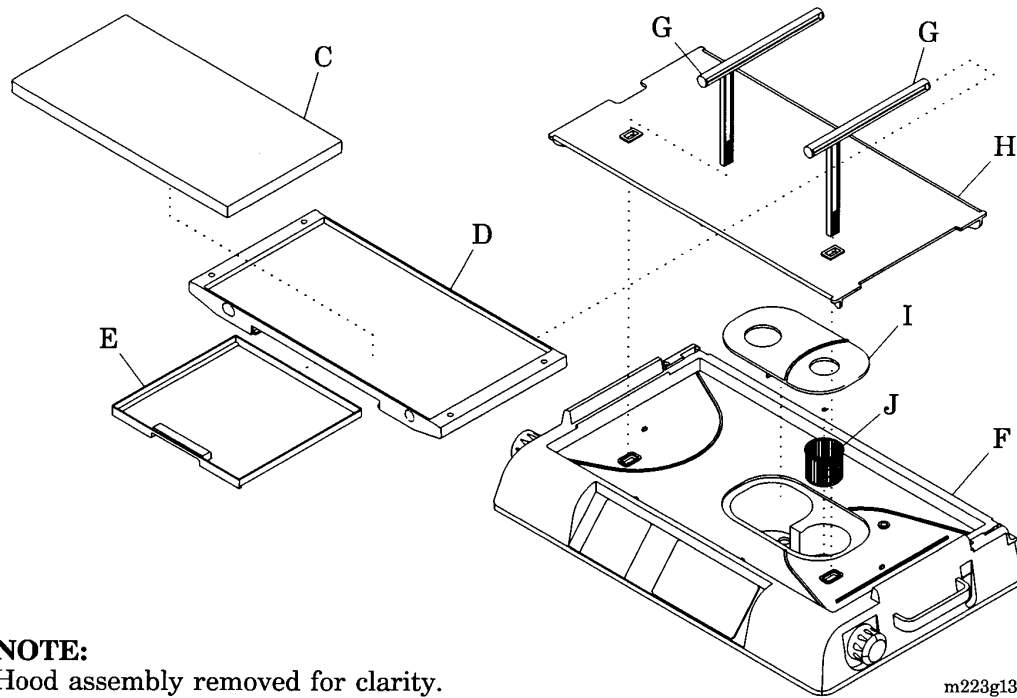
- b. Go to RAP 2.31 on page 2-92.

The problem still exists.

Yes	No
↓	→ Go to “Final Actions” on page 2-22.

2. Perform the following:
 - a. Slowly tilt the hood assembly (B) back until it comes to rest.
 - b. Remove the foam mattress (C), the mattress tray (D), and the x-ray tray (E) from the shell assembly (F) (see figure 2-22 on page 2-57).

Figure 2-22. Shell Assembly



NOTE:

Hood assembly removed for clarity.

- c. Remove the two lift bars (G) and the deck (H) from the shell assembly (F).
- d. Remove the scroll cover (I) from the shell assembly (F).
- e. Check the impeller assembly (J).

The impeller assembly (J) is clean.

Yes No

↓ → Clean the impeller assembly (J). If this solves the problem, go to "Final Actions" on page 2-22. Otherwise, go to step 3.

3. Replace the impeller assembly (J) (refer to procedure 4.8 on page 4-20). This solves the problem.

Yes No

↓ → For assistance, call Technical Support at (800) 437-2437.

4. Go to "Final Actions" on page 2-22.

2.6 Hood Does Not Tilt or Close Properly

1. Perform the following:

- a. Disconnect the weighing scale cable (A) from the sensor module assembly (B) (see figure 2-23 on page 2-59).
- b. Slowly tilt the hood assembly (C) back until it comes to rest.

The hood assembly (C) rests once it reaches its fully opened position.

Yes No

↓ → Replace the pivot/hook lock assembly bracket (D) or the pivot bracket (E) (refer to procedure 4.28 on page 4-74). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Perform the following:

- a. On a unit equipped with the pivot/hook lock assembly bracket (D), pull on and hold the knob (F) located on the right rear pivot/hook lock assembly bracket (D).
- b. Lower the hood assembly (C) to its closed position.

The problem still exists.

Yes No

↓ → Connect the weighing scale cable (A) to the sensor module assembly (B), and go to “Final Actions” on page 2-22.

3. Check the area around the hood assembly (C) for obstruction, such as blankets between the hood assembly (C) and the shell assembly (G), or objects above the hood assembly (C). The area around the hood assembly (C) is free from obstruction.

Yes No

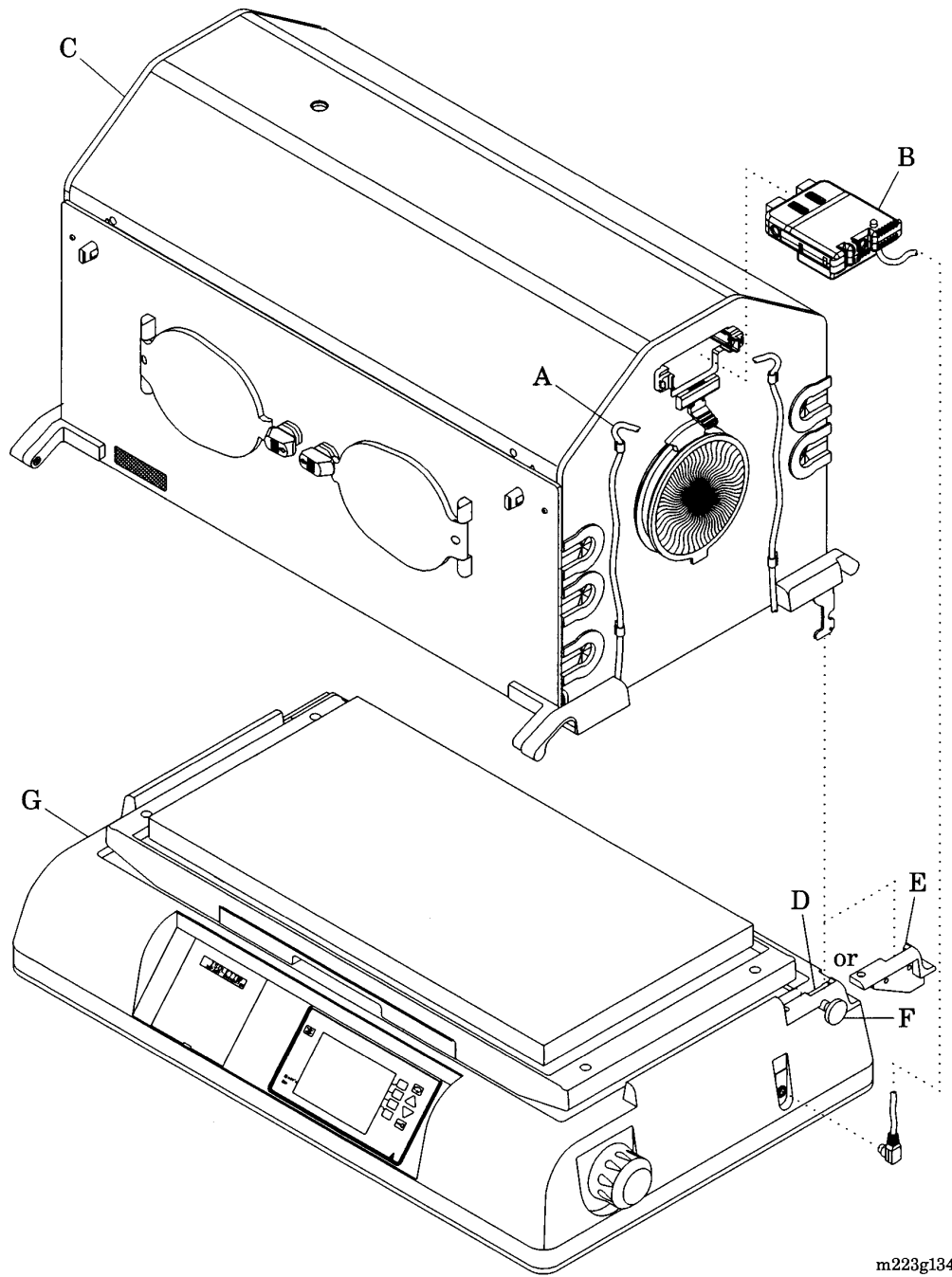
↓ → Remove the obstruction. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 4.

4. Replace the hood assembly (C) (refer to procedure 4.5 on page 4-12). This solves the problem.

Yes No

↓ → For assistance, call Technical Support at (800) 437-2437.

Figure 2-23. Hood Assembly



5. Perform the following:
 - a. Connect the weighing scale cable (A) to the sensor module assembly (B).
 - b. Go to “Final Actions” on page 2-22.

2.7 Controller Failure #1—EEPROM Circuitry Failure

1. Replace the electroluminescent (EL) central processing unit (CPU) P.C. board (refer to procedure 4.15 on page 4-41). This solves the problem.

Yes No

↓

→ For assistance, call Technical Support at (800) 437-2437.

2. Go to “Final Actions” on page 2-22.

2.8 Controller Failure #2—Ambient Air Probe Failure

1. Access the **Data Summary (1 of 2)** screen. The readings for **Ambient Temp 1** and **Ambient Temp 2** are approximately the same.

Yes No

↓

→ Replace the electroluminescent (EL) central processing unit (CPU) P.C. board (refer to procedure 4.15 on page 4-41). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. The **Control Fan Speed** reading meets the specification of **2500 rpm ± 50%**.

Yes No

↓

→ Go to RAP 2.9 on page 2-63. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 3.

3. Replace the electroluminescent EL CPU P.C. board (refer to procedure 4.15 on page 4-41). This solves the problem.

Yes No

↓

→ For assistance, call Technical Support at (800) 437-2437.

4. Go to “Final Actions” on page 2-22.

2.9 Controller Failure #4—Controller Cooling Fan Failure

1. Access the **Data Summary (1 of 2)** screen (see “Diagnostic Menus” on page 2-33). The **Control Fan Speed** meets the specification of **2500 rpm \pm 50%**.

Yes No

↓

→ Replace the controller assembly’s fan assembly (refer to procedure 4.16 on page 4-43). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Replace the interface P.C. board assembly (refer to procedure 4.18 on page 4-47). This solves the problem.

Yes No

↓

→ For assistance, call Technical Support at (800) 437-2437.

3. Go to “Final Actions” on page 2-22.

2.10 Controller Failure #5—Display Test Failure

1. Turn the controller assembly off, and then turn it back on. The screen flashes briefly, and then turns black.

Yes No

↓

→ Replace the electroluminescent (EL) display (refer to procedure 4.15 on page 4-41). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Replace the EL central processing unit (CPU) P.C. board assembly (refer to procedure 4.15 on page 4-41). This solves the problem.

Yes No

↓

→ For assistance, call Technical Support at (800) 437-2437.

3. Go to “Final Actions” on page 2-22.

2.11 Controller Failure #7—Power Supply Voltage Failure

1. Replace the power supply P.C. board assembly (refer to procedure 4.18 on page 4-47). This solves the problem.

Yes No

↓

→ For assistance, call Technical Support at (800) 437-2437.

2. Go to “Final Actions” on page 2-22.

2.12 Controller Failure #8—RAM Test Failure

1. Replace the electroluminescent (EL) central processing unit (CPU) P.C. board assembly (refer to procedure 4.15 on page 4-41). This solves the problem.

Yes No

↓

→ For assistance, call Technical Support at (800) 437-2437.

2. Go to “Final Actions” on page 2-22.

2.13 Controller Failure #9—Real-Time Clock Failure

1. Replace the electroluminescent (EL) central processing unit (CPU) P.C. board assembly (refer to procedure 4.15 on page 4-41). This solves the problem.

Yes No

↓

→ For assistance, call Technical Support at (800) 437-2437.

2. Go to “Final Actions” on page 2-22.

2.14 Controller Failure #10—Watchdog Timer Failure

1. Replace the electroluminescent (EL) central processing unit (CPU) P.C. board assembly (refer to procedure 4.15 on page 4-41). This solves the problem.

Yes No

↓

→ For assistance, call Technical Support at (800) 437-2437.

2. Go to “Final Actions” on page 2-22.

2.15 Controller Failure #11—Relay Test Failure

1. Replace the interface P.C. board assembly (refer to procedure 4.18 on page 4-47). This solves the problem.

Yes No

↓

→ For assistance, call Technical Support at (800) 437-2437.

2. Go to “Final Actions” on page 2-22.

2.16 Controller Failure #13—Heater Circuit Failure Detected

1. Replace the interface P.C. board assembly (refer to procedure 4.18 on page 4-47). This solves the problem.

Yes No

↓ → For assistance, call Technical Support at (800) 437-2437.

2. Go to “Final Actions” on page 2-22.

2.17 Controller Failure #14—Low Heater Current Detected

1. Access the **Data Summary (2 of 2)** screen (see “Diagnostic Menus” on page 2-33). The **AC Current** meets the specification of 3 A.

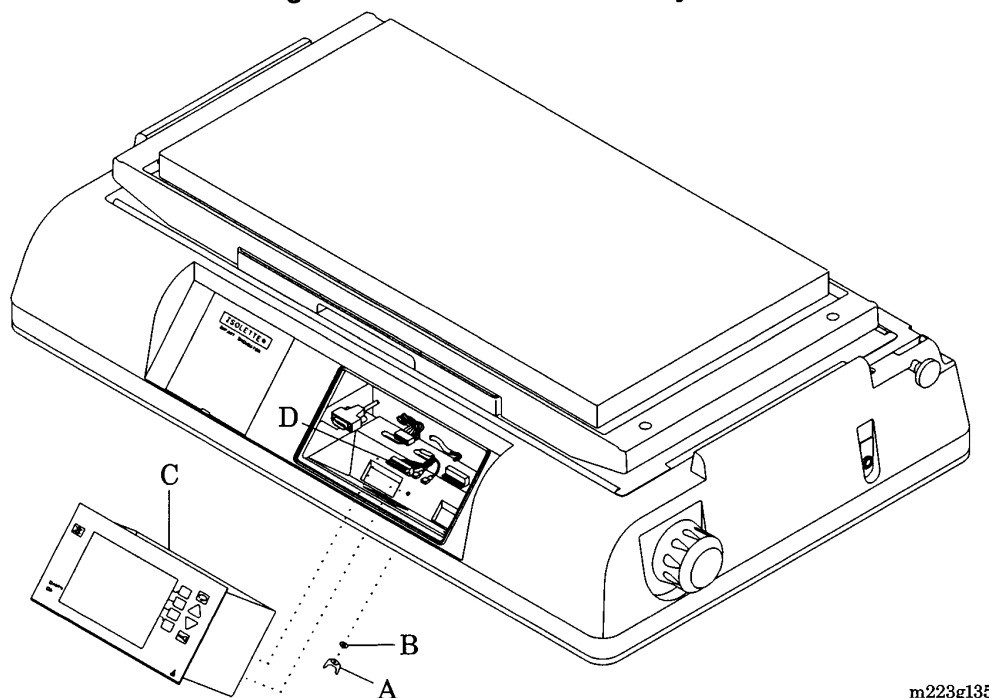
Yes	No
↓	→ Replace the heater assembly (refer to procedure 4.20 on page 4-50). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.
2. Replace the interface P.C. board assembly (refer to procedure 4.18 on page 4-47). This solves the problem.

Yes	No
↓	→ For assistance, call Technical Support at (800) 437-2437.
3. Go to “Final Actions” on page 2-22.

2.18 Heater Thermocouple Does Not Work Properly

1. Perform the following:
 - a. Remove the two wingnuts (A) and the two flat washers (B) that secure the controller assembly (C) in the unit (see figure 2-24 on page 2-72).

Figure 2-24. Controller Assembly



- b. Slide the controller assembly (C) from the unit (refer to procedure 4.4 on page 4-10).
 - c. Check the connection of the heater assembly's wiring harness assembly (D) at the interface/power supply module in the controller assembly (C).

The heater assembly's wiring harness assembly (D) is securely connected at the controller assembly (C).

- | | |
|------------|--|
| Yes | No |
| ↓ | → |
| | Securely connect the heater assembly's wiring harness assembly (D) at the interface/power supply module in the controller assembly (C). If this solves the problem, go to "Final Actions" on page 2-22. Otherwise, go to step 2. |

2. Replace the AC wiring harness assembly (D) (refer to procedure 4.22 on page 4-57). The problem still exists.

Yes No

↓

→ Go to “Final Actions” on page 2-22.

3. Replace the heater assembly (refer to procedure 4.20 on page 4-50). This solves the problem.

Yes No

↓

→ For assistance, call Technical Support at (800) 437-2437.

4. Go to “Final Actions” on page 2-22.

2.19 Humidity Heater Draws Too Much Current

1. Replace the evaporator reservoir assembly (refer to procedure 7.3 on page 7-14). This solves the problem.

Yes No

↓

→ For assistance, call Technical Support at (800) 437-2437.

2. Go to “Final Actions” on page 2-22.

2.20 Motor Fails

1. Access the **Diagnostic Info** screen (see “Diagnostic Menus” on page 2-33). The **Software Version** meets the specification of **2.06** or later.

Yes No

↓

→ Upgrade the firmware to the latest version (refer to procedure 6.8 on page 6-34). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Perform the following:

- a. Close all access panels.

- b. At the **Diagnostic Info** screen, check the **Fan Speed**.

The **Fan Speed** meets the specification of **1550 rpm ± 450 rpm**.

Yes No

↓

→ Replace the impeller movement detection sensor (refer to procedure 4.21 on page 4-53). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 4.

3. Go to step 5.

4. Replace the impeller assembly (refer to procedure 4.8 on page 4-20). The problem still exists.

Yes No

↓

→ Go to “Final Actions” on page 2-22.

5. Replace the motor assembly (refer to procedure 4.9 on page 4-22). This solves the problem.

Yes No

↓

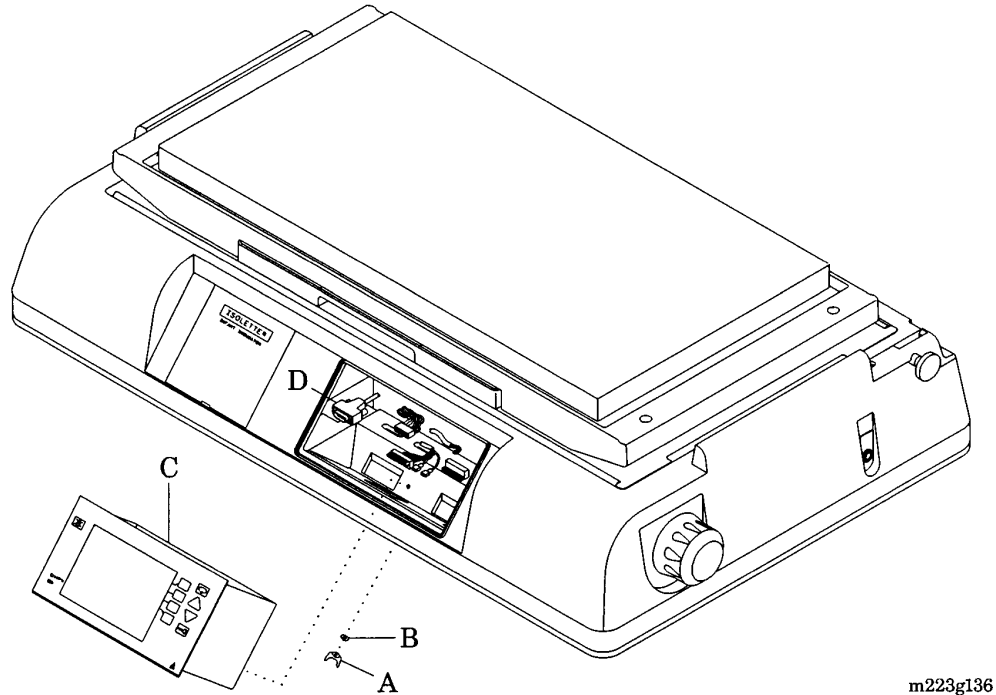
→ For assistance, call Technical Support at (800) 437-2437.

6. Go to “Final Actions” on page 2-22.

2.21 Communication Between the Sensor Module and the Controller Fails

1. Perform the following:
 - a. Remove the two wingnuts (A) and the two flat washers (B) that secure the controller assembly (C) in the unit (see figure 2-25 on page 2-76).

Figure 2-25. Controller Assembly



- b. Slide the controller assembly (C) from the unit.
 - c. Check the connection of the sensor module-to-controller cable assembly (D) at the controller assembly (C).

The sensor module-to-controller cable assembly (D) is securely connected at the controller assembly (C).

Yes	No
↓	→ Securely connect the sensor module-to-controller cable assembly (D) to the controller assembly (C). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Replace the sensor module-to-controller cable assembly (D) (refer to procedure 4.23 on page 4-62). The problem still exists.

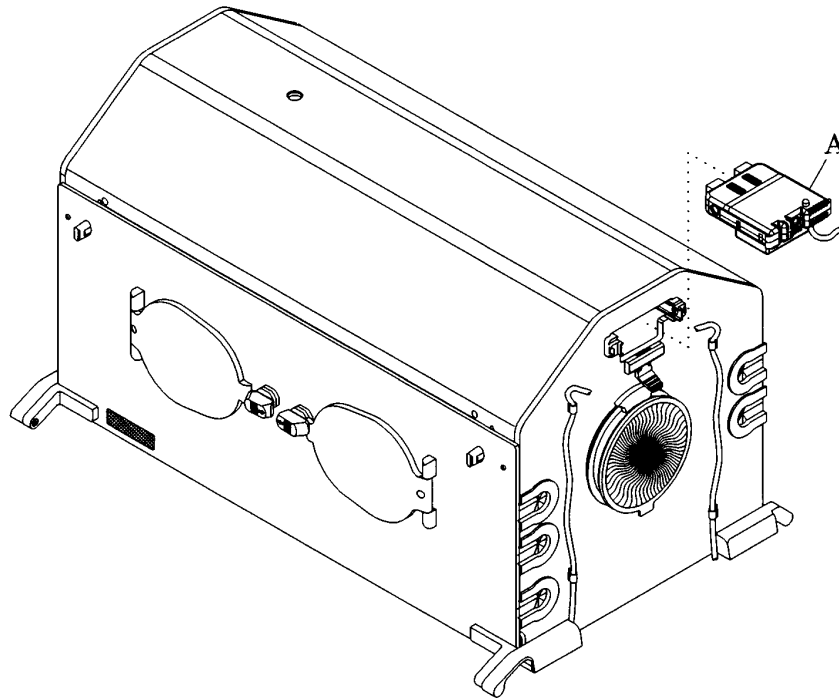
Yes	No
↓	→ Go to “Final Actions” on page 2-22.
3. Replace the sensor module assembly (refer to procedure 4.2 on page 4-6). This solves the problem.

Yes	No
↓	→ For assistance, call Technical Support at (800) 437-2437.
4. Go to “Final Actions” on page 2-22.

2.22 Sensor Module Is Out of Position

1. The sensor module assembly (A) is properly positioned in the hood or calibration fixture (see figure 2-26 on page 2-78).

Figure 2-26. Sensor Module Assembly



Yes **No**
↓

→ Properly position the sensor module assembly (A) in the hood or calibration fixture. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Replace the sensor module assembly (A) (refer to procedure 4.2 on page 4-6). This solves the problem.

Yes **No**
↓

→ For assistance, call Technical Support at (800) 437-2437.

3. Go to “Final Actions” on page 2-22.

2.23 A Stuck Key Is Detected

1. Perform the following:
 - a. Access the **Key Check** screen (see “Diagnostic Menus” on page 2-33).
 - b. Press each key in succession.

Each box on the screen illuminates when its respective key is pressed.

Yes	No
↓	→ Replace the electroluminescent display (refer to procedure 4.14 on page 4-39). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. The problem still exists.

Yes	No
↓	→ Go to “Final Actions” on page 2-22.

3. For assistance, call Technical Support at (800) 437-2437.

2.24 Unit Fails the Non-Volatile Memory (NVM) Integrity Test

1. Replace the electroluminescent (EL) central processing unit (CPU) P.C. board (refer to procedure 4.15 on page 4-41). This solves the problem.

Yes No

↓

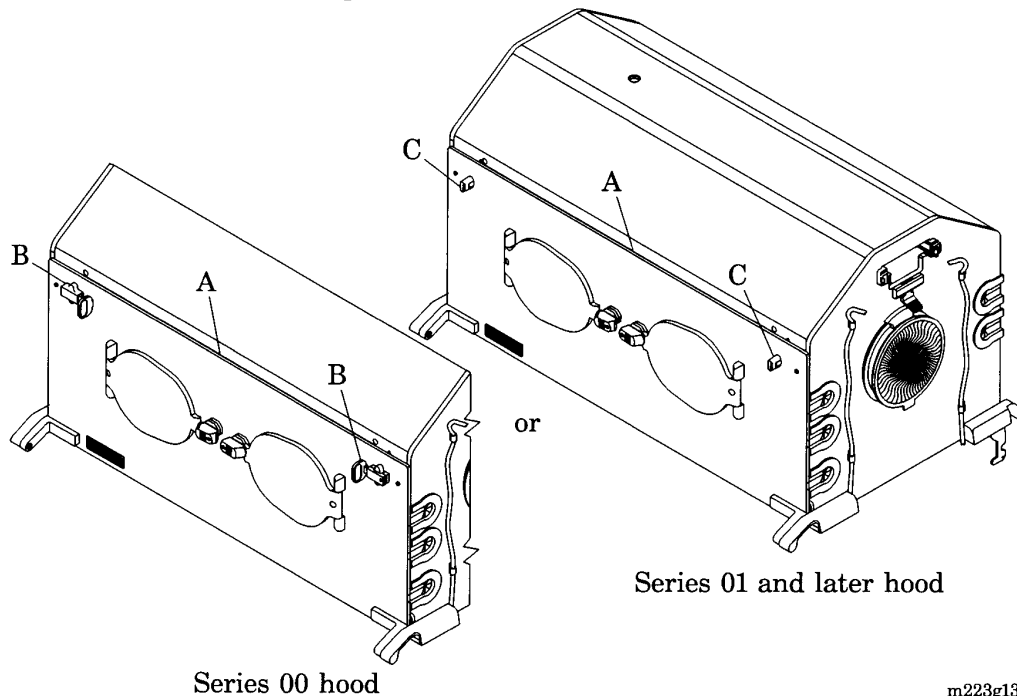
→ For assistance, call Technical Support at (800) 437-2437.

2. Go to “Final Actions” on page 2-22.

2.25 Access Panel Assembly Does Not Latch Properly

1. Check the area around the access panel assembly (A) for obstruction (see figure 2-27 on page 2-81). The area around the access panel assembly (A) is free from obstruction.

Figure 2-27. Side Access Panel



m223g138

Series 00 hood

Yes No

↓

→ Remove the obstruction from the access panel assembly (A). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. The access panel assembly (A) is a Series 00 model.

Yes No

↓

→ Go to step 5.

3. Slide the blue slide of the access panel latch assemblies (B) back and forth. The blue slides of the access panel latch assemblies (B) slide properly.

Yes No

↓

→ Replace the access panel assembly (A) (refer to procedure 4.10 on page 4-27). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, call Technical Support at (800) 437-2437 for assistance.

4. Go to step 6.

5. Rotate the access panel knob and latch assemblies (C). The access panel knob and latch assemblies (C) rotate properly.

Yes No

↓

→ Replace the access panel knob and latch assembly (C) (refer to procedure 4.24 on page 4-67). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 6.

6. Replace the access panel assembly (A) (refer to procedure 4.10 on page 4-27). This solves the problem.

Yes No

↓

→ For assistance, call Technical Support at (800) 437-2437.

7. Go to “Final Actions” on page 2-22.

2.26 Iris Entry Port Does Not Open or Close Properly

1. Replace the sleeve of the iris entry port (refer to procedure 4.11 on page 4-31). The problem still exists.

Yes No

↓

→ Go to “Final Actions” on page 2-22.

2. Replace the two large flanged iris port retaining rings (refer to procedure 4.25 on page 4-70). This solves the problem.

Yes No

↓

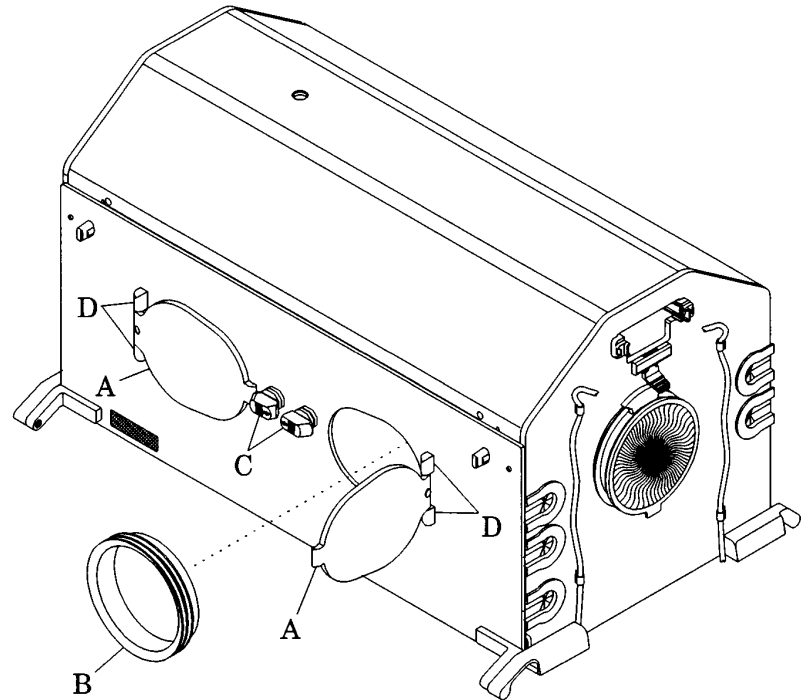
→ For assistance, call Technical Support at (800) 437-2437.

3. Go to “Final Actions” on page 2-22.

2.27 Access Door Does Not Operate or Latch Properly

1. Inspect each access door (A) (see figure 2-28 on page 2-84). The access doors (A) are free from cracks and in good condition.

Figure 2-28. Access Door



- | | |
|------------|-----------|
| Yes | No |
| ↓ | → |
- Replace the access door (A) (refer to procedure 4.13 on page 4-36). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.
2. Inspect the area around the access door (A) for possible obstruction. The area around the access door (A) is free from obstruction.
- | | |
|------------|-----------|
| Yes | No |
| ↓ | → |
- Remove the obstruction from the access door (A). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 3.
3. Close each access door (A). Each access door (A) closes properly.
- | | |
|------------|-----------|
| Yes | No |
| ↓ | → |
- Replace the access door gasket (B) (refer to procedure 4.27 on page 4-73). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 4.

4. Press the access door latch (C) at each access door (A). Each access door (A) swings open.

Yes No

↓

→ Replace the access door latch (C) (refer to procedure 4.12 on page 4-33). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 5.

5. The problem is solved.

Yes No

↓

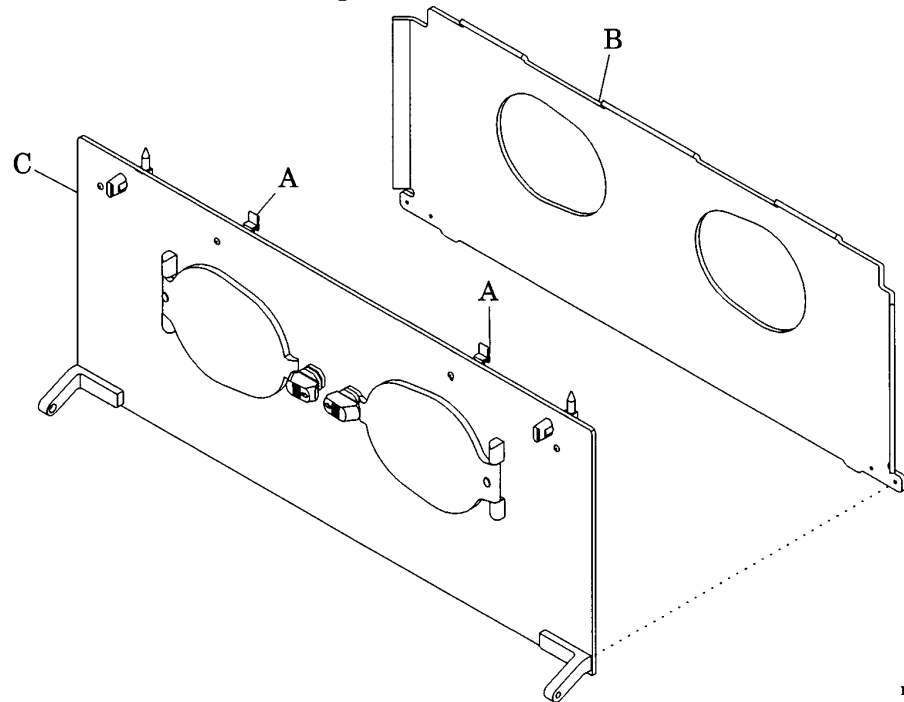
→ Replace the pivot hinges (D) and the torsion spring on the access door (A) (refer to procedure 4.13 on page 4-36). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, call Technical Support at (800) 437-2437 for assistance.

6. Go to “Final Actions” on page 2-22.

2.28 Heat Shield Does Not Latch Properly

1. Using the heat shield latches (A), properly secure the top of the heat shield (B) to the access panel (C) (see figure 2-29 on page 2-86). The problem still exists.

Figure 2-29. Heat Shield



m223g140

Yes **No**
↓ → Go to “Final Actions” on page 2-22.

2. Check the area between the heat shield (B) and the access panel (C) for possible obstruction. The area between the heat shield (B) and access panel (C) is free from obstruction.

Yes **No**
↓ → Remove the obstruction from between the heat shield (B) and the access panel (C). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 3.

3. Replace the heat shield latches (A) (refer to procedure 4.29 on page 4-77). The problem still exists.

Yes **No**
↓ → Go to “Final Actions” on page 2-22.

4. Replace the heat shield (B) (refer to procedure 4.30 on page 4-79). This solves the problem.

Yes No

↓

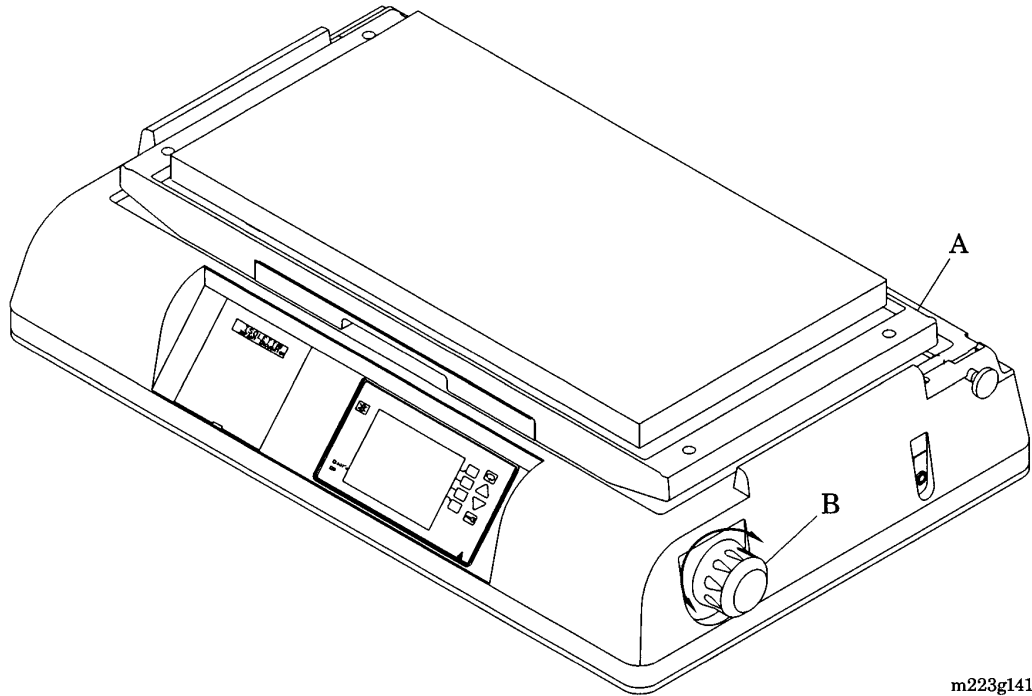
→ For assistance, call Technical Support at (800) 437-2437.

5. Go to “Final Actions” on page 2-22.

2.29 Mattress Tray Does Not Tilt Properly

1. Check the area around the mattress tray (A) for possible obstruction (see figure 2-30 on page 2-88). The mattress tray (A) is free from obstruction.

Figure 2-30. Mattress Tray Assembly



m223g141

- | | |
|------------|-----------|
| Yes | No |
| ↓ | → |
- Remove the obstruction from the mattress tray (A). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.
2. Inspect the condition of the mattress tray (A). The mattress tray (A) is in good condition.
- | | |
|------------|-----------|
| Yes | No |
| ↓ | → |
- Go to RAP 2.30 on page 2-90.
3. Rotate the right-hand mattress tilt mechanism knob (B) counterclockwise until it stops. The right end of the mattress tray (A) is at a 12° angle.
- | | |
|------------|-----------|
| Yes | No |
| ↓ | → |
- Replace the right-hand mattress tilt mechanism (refer to procedure 4.32 on page 4-87). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 5.

4. Rotate the right-hand mattress tilt mechanism knob (B) clockwise until it stops. The mattress tray (A) is level.

Yes No



→ Replace the right-hand mattress tilt mechanism (refer to procedure 4.32 on page 4-87). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 5.

5. Rotate the left-hand mattress tilt mechanism knob (B) clockwise. The left end of the mattress tray (A) is at a 12° angle.

Yes No



→ Replace the left-hand mattress tilt mechanism (refer to procedure 4.32 on page 4-87). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, call Technical Support at (800) 437-2437 for assistance.

6. Rotate the left-hand mattress tilt mechanism knob (B) counterclockwise. The mattress tray (A) is level.

Yes No



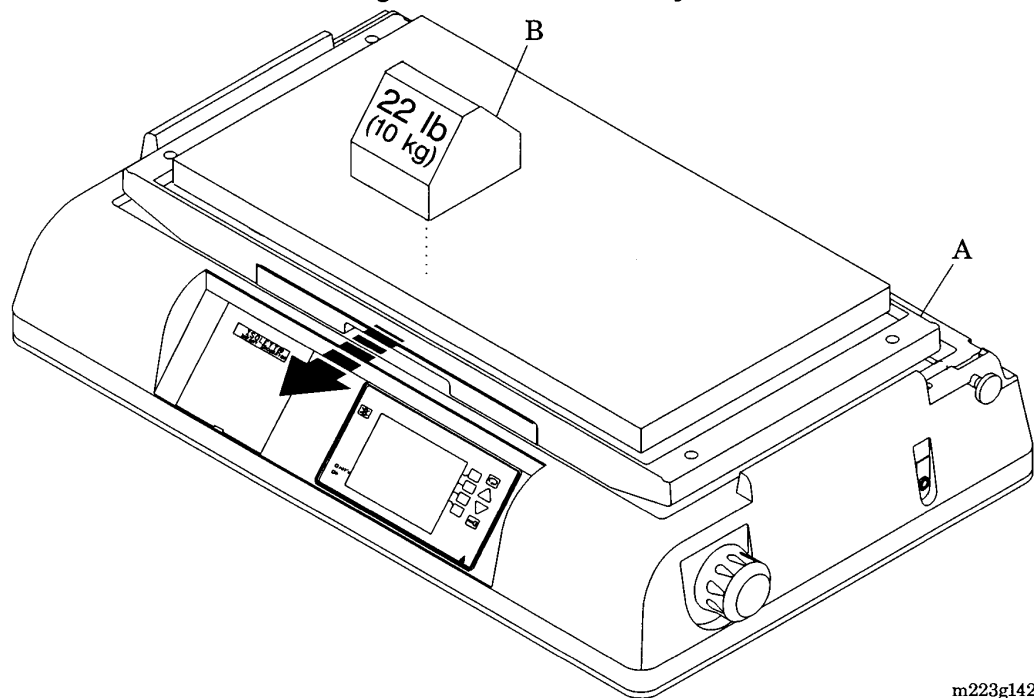
→ Replace the left-hand mattress tilt mechanism (refer to procedure 4.32 on page 4-87). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, call Technical Support at (800) 437-2437 for assistance.

7. Go to “Final Actions” on page 2-22.

2.30 Mattress Tray Is Damaged

1. Perform the following:
 - a. On a unit with a Series 00 hood assembly, slide the blue slide access panel latches, and open the access panel (see figure 2-2 on page 2-10).
or
On a unit with a hood assembly later than Series 00, rotate the access panel pawl latch knobs, and open the access panel.
 - b. Pivot the access panel to the full-open position so it hangs straight down.
 - c. Slide out the mattress tray (A) to the fully-extended position (see figure 2-31 on page 2-90).

Figure 2-31. Mattress Tray



m223g142

- d. Gradually load a calibrated weight of 22 lb (10 kg) (B) near the front-center of the extended mattress tray (A), ensuring a firm infant platform.

The mattress tray (A) is a firm platform for an infant.

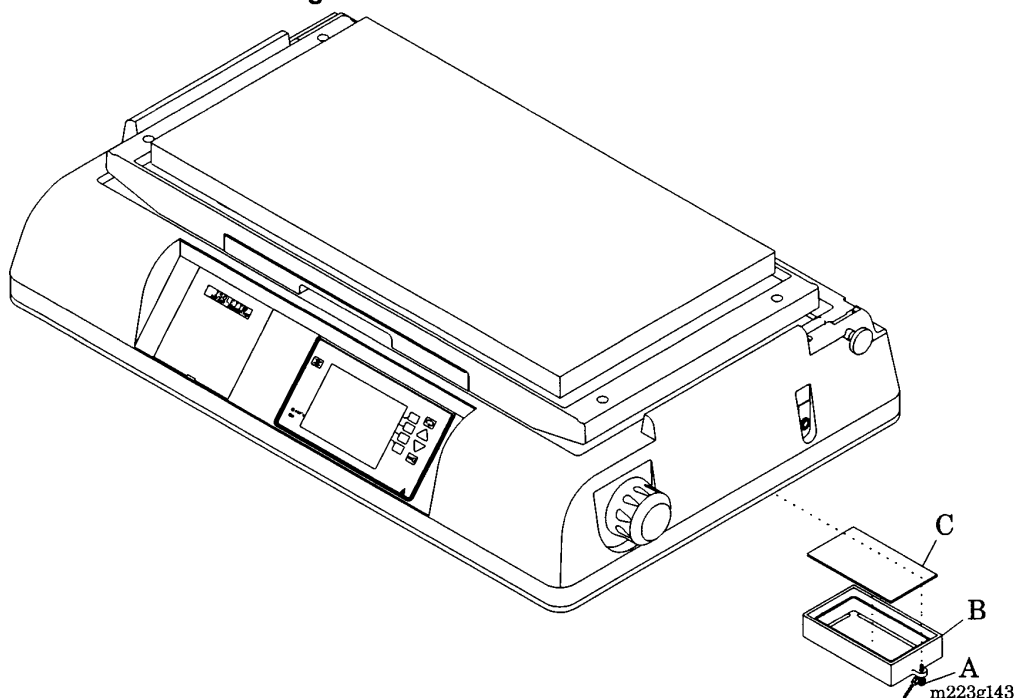
Yes	No
↓	→ Replace the mattress tray (A) (refer to procedure 4.7 on page 4-18). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, call Technical Support at (800) 437-2437 for assistance.

2. Perform the following:
 - a. Return the mattress tray (A) to its original position.
 - b. Close the access panel, and secure it using its blue slide access panel latches or its access panel pawl latch knobs.
 - c. Go to “Final Actions” on page 2-22.

2.31 Air Intake Is Not Working Properly

1. Perform the following:
 - a. Loosen the two thumbscrews (A) on the air intake filter cover (B), and remove the air intake filter cover (B) (see figure 2-32 on page 2-92).

Figure 2-32. Air Intake Microfilter



- b. Inspect the air intake filter cover (B).

The air intake filter cover (B) is free from obstruction.

Yes No

↓

→ Remove the obstruction from the air intake filter cover (B). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.



WARNING:

A dirty air intake microfilter may affect oxygen concentrations and/or cause carbon dioxide build-up. Check the filter routinely, and change it at least every 3 months or when it is visibly dirty. Failure to do so could result in infant injury.

2. Inspect the air intake microfilter (C). The air intake microfilter (C) has no visible dirt, is dry, and has been used for less than three months.

Yes No

↓

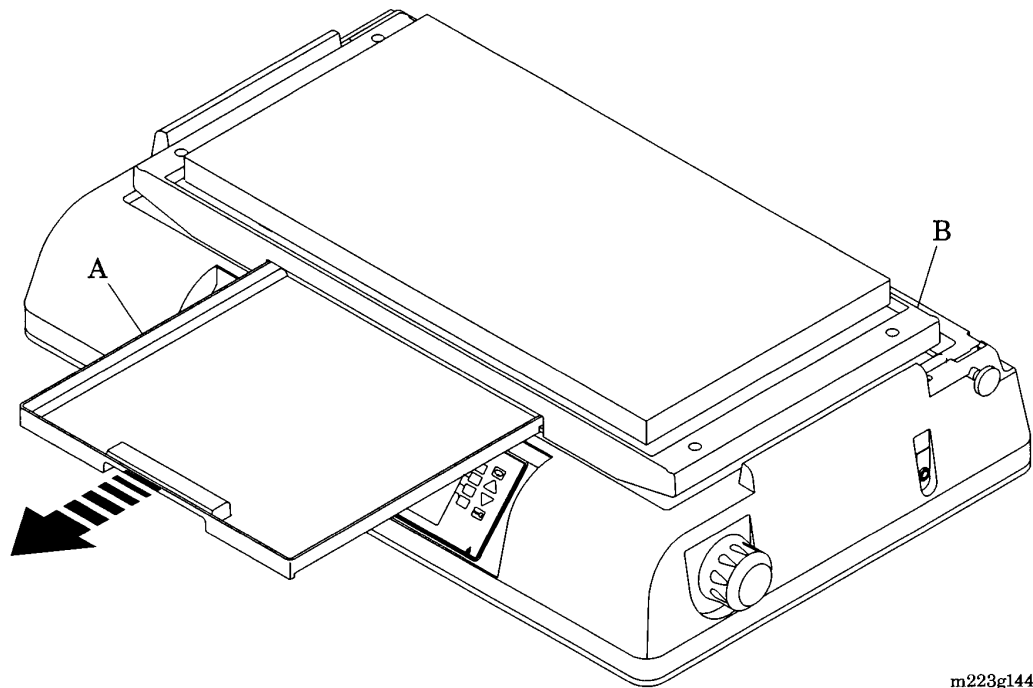
→ Replace the air intake microfilter (C) (refer to procedure 4.19 on page 4-49). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, call Technical Support at (800) 437-2437 for assistance.

3. Go to “Final Actions” on page 2-22.

2.32 X-ray Tray Does Not Operate Properly

1. Perform the following:
 - a. On a unit with a Series 00 hood assembly, slide the blue slide access panel latches, and open the access panel (see figure 2-2 on page 2-10).
or
On a unit with a hood assembly later than Series 00, rotate the access panel pawl latch knobs, and open the access panel.
 - b. Pivot the access panel to the full-open position so it hangs straight down.
 - c. Withdraw the x-ray tray (A) (see figure 2-33 on page 2-94).

Figure 2-33. X-ray Tray



m223g144

- d. Return the x-ray tray (A) to its original position.

The problem still exists.

Yes	No
↓	→ Go to “Final Actions” on page 2-22.

2. Inspect the x-ray tray (A). The x-ray tray (A) is free from obstruction.

Yes No

↓

→ Remove the obstruction from the x-ray tray (A). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 3.

3. Replace the x-ray tray (A) (refer to procedure 4.7 on page 4-18). The problem still exists.

Yes No

↓

→ Go to “Final Actions” on page 2-22.

4. Replace the mattress tray (B) (refer to procedure 4.7 on page 4-18). This solves the problem.

Yes No

↓

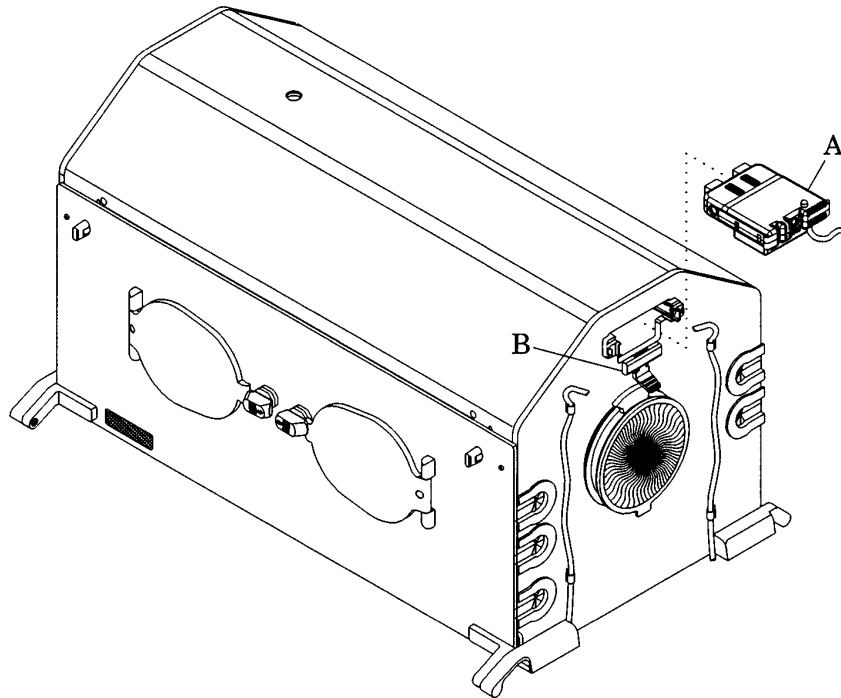
→ For assistance, call Technical Support at (800) 437-2437.

5. Go to “Final Actions” on page 2-22.

2.33 Sensor Module Lock Does Not Secure the Sensor Module (Units Equipped With the Sensor Module Lock Only)

1. Check the area around the sensor module (A) for obstruction (see figure 2-34 on page 2-96). The sensor module (A) is free from obstruction.

Figure 2-34. Sensor Module



m223g145

Yes	No
↓	→
	Remove the obstruction from the sensor module (A). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Replace the sensor module lock (B) (refer to procedure 4.33 on page 4-91). This solves the problem.

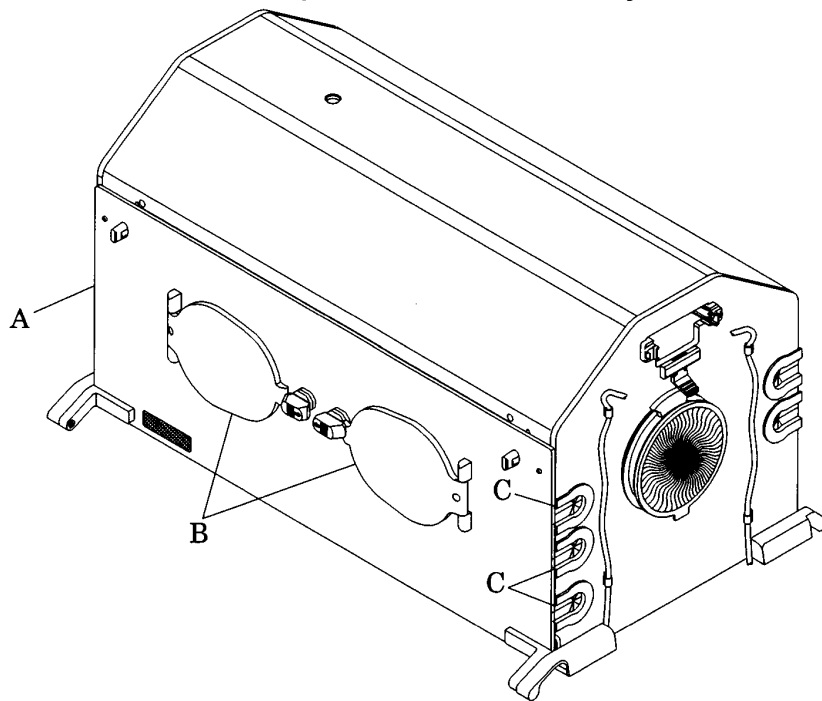
Yes	No
↓	→
	For assistance, call Technical Support at (800) 437-2437.

3. Go to “Final Actions” on page 2-22.

2.34 Incubator Takes Longer Than One Hour to Warm Up to the Air Set Temperature

1. Close all access panels (A) and access doors (B) (see figure 2-35 on page 2-97). This solves the problem.

Figure 2-35. Hood Assembly



m223g146

Yes **No**
↓ → Go to step 3.

2. Go to "Final Actions" on page 2-22.

3. Check all access grommets (C). All access grommets (C) are securely installed.

Yes **No**
↓ → Securely install access grommets (C) (refer to procedure 4.34 on page 4-93). If this solves the problem, go to "Final Actions" on page 2-22. Otherwise, go to step 4.

4. All access grommets (C) are in good condition.

Yes No

↓

→ Replace the access grommet (C) (refer to procedure 4.34 on page 4-93). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 5.

5. Go to RAP 2.18 on page 2-72. This solves the problem.

Yes No

↓

→ For assistance, call Technical Support at (800) 437-2437.

6. Go to “Final Actions” on page 2-22.

2.35 Air Set Temperature Cannot Be Maintained

1. The unit is in Air Mode.

Yes **No**



→ Change the mode of operation to Air Mode. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. The air set temperature is set to at least 95°F (35°C).

Yes **No**



→ Set the air set temperature to at least 95°F (35°C). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 3.

3. Go to RAP 2.18 on page 2-72. This solves the problem.

Yes **No**



→ For assistance, call Technical Support at (800) 437-2437.

4. Go to “Final Actions” on page 2-22.

2.36 Low Air Temperature Alarm or High Air Temperature Alarm Does Not Sound When Air Temperature Drops or Rises Out of Specification

1. The unit is in Air Mode.

Yes No

↓

→ Change the mode of operation to Air Mode. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Replace the interface P.C. board assembly (refer to procedure 4.18 on page 4-47). The problem still exists.

Yes No

↓

→ Go to “Final Actions” on page 2-22.

3. Replace the electroluminescent (EL) central processing unit (CPU) P.C. board (refer to procedure 4.15 on page 4-41). This solves the problem.

Yes No

↓

→ For assistance, call Technical Support at (800) 437-2437.

4. Go to “Final Actions” on page 2-22.

2.37 Low Skin Temperature Alarm or High Skin Temperature Alarm Does Not Sound When Skin Temperature Drops or Rises Out of Specification

1. The unit is in Skin Mode.

Yes No

↓

→ Change the mode of operation to Skin Mode. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Replace the interface P.C. board assembly (refer to procedure 4.18 on page 4-47). The problem still exists.

Yes No

↓

→ Go to “Final Actions” on page 2-22.

3. Replace the electroluminescent (EL) central processing unit (CPU) P.C. board (refer to procedure 4.15 on page 4-41). This solves the problem.

Yes No

↓

→ For assistance, call Technical Support at (800) 437-2437.

4. Go to “Final Actions” on page 2-22.

2.38 When Skin Probes are Disconnected, Connect Skin 1 Probe Alarm Does Not Sound

1. The unit is in Skin Mode.

Yes	No
↓	→ Change the mode of operation to Skin Mode. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Go to RAP 2.42 on page 2-107.

2.39 Incubator's Air Temperature Exceeds Air Set Temperature by 1.5°C or Greater, or Infant's Skin Temperature Exceeds Skin Set Temperature by 1.0°C or Greater

1. The unit is in Air Mode.

Yes **No**
↓ → Go to step 4.

2. The **High Air Temperature** alarm sounds.

Yes **No**
↓ → Go to RAP 2.36 on page 2-100.

3. Go to step 5.

4. The **High Skin Temperature** alarm sounds.

Yes **No**
↓ → Go to RAP 2.37 on page 2-101.

5. Perform the following:

- a. Silence the **High Air/Skin Temperature** alarm for 15 minutes or silence the **High Temperature Cut Out** alarm for 5 minutes by pressing the **Silence/Reset** softkey.

- b. Check the airflow vents on the surface of the shell assembly.

The vents are free from obstruction.

Yes **No**
↓ → Remove the obstruction from the airflow vents. If this solves the problem, go to "Final Actions" on page 2-22. Otherwise, go to step 6.

6. The heater automatically turns itself off.

Yes **No**
↓ → Go to RAP 2.18 on page 2-72. If this solves the problem, go to "Final Actions" on page 2-22. Otherwise, call Technical Support at (800) 437-2437 for assistance.

7. The problem still exists.

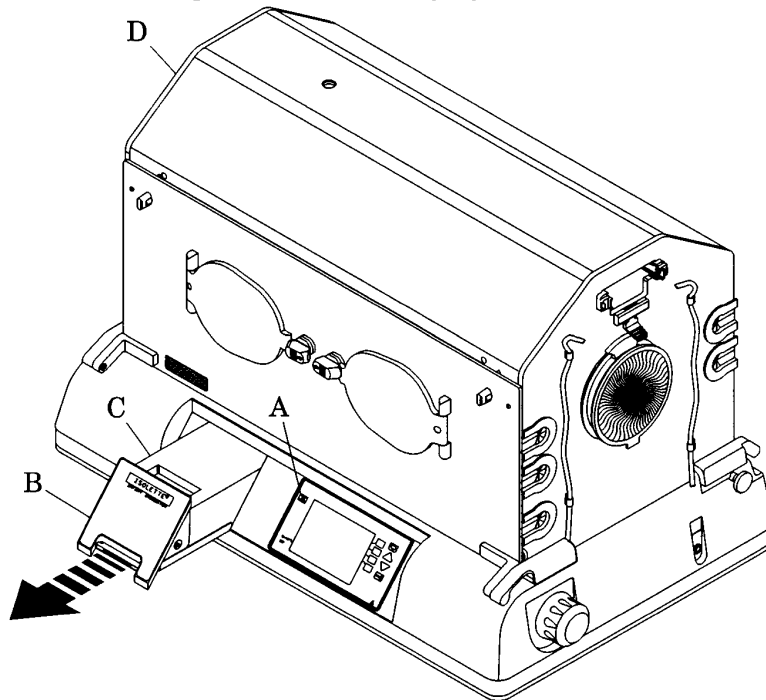
Yes **No**
↓ → Go to "Final Actions" on page 2-22.

8. For assistance, call Technical Support at (800) 437-2437.

2.40 Humidity System Is Not Working Properly

1. Perform the following:
 - a. If the **Low Humidity** alarm sounds, press the **Silence/Reset** key (A) to silence it for 5 minutes (see figure 2-36 on page 2-104).

Figure 2-36. Humidity System



m223g147

- b. Withdraw the humidity tray (B) to the fill position.
 - c. Check the humidity reservoir (C).

The humidity reservoir (C) is filled.

Yes No

↓

→ Fill the humidity reservoir (C) with distilled water (refer to procedure 6.7 on page 6-33). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Perform the following:
 - a. Warm the incubator to 95°F (35°C).
 - b. At **Display 1**, press the **Humidity** softkey to turn on the humidity.
 - c. Set the humidity setpoint to **50%**.

- d. Using a calibrated hygrometer, monitor the relative humidity level within the hood assembly (D).

Within 30 to 60 minutes, the hygrometer and **Humidity** display do **not** both read **50% ± 9%**.

Yes No



→ Go to “Final Actions” on page 2-22.

3. For assistance, call Technical Support at (800) 437-2437.

2.41 Power Failure Alarm Sounds

1. Perform the following:
 - a. Silence the **Power Failure** alarm for 15 minutes by pressing the **Silence/Reset** softkey.
 - b. Plug the unit into an appropriate power source.

This solves the problem.

Yes **No**

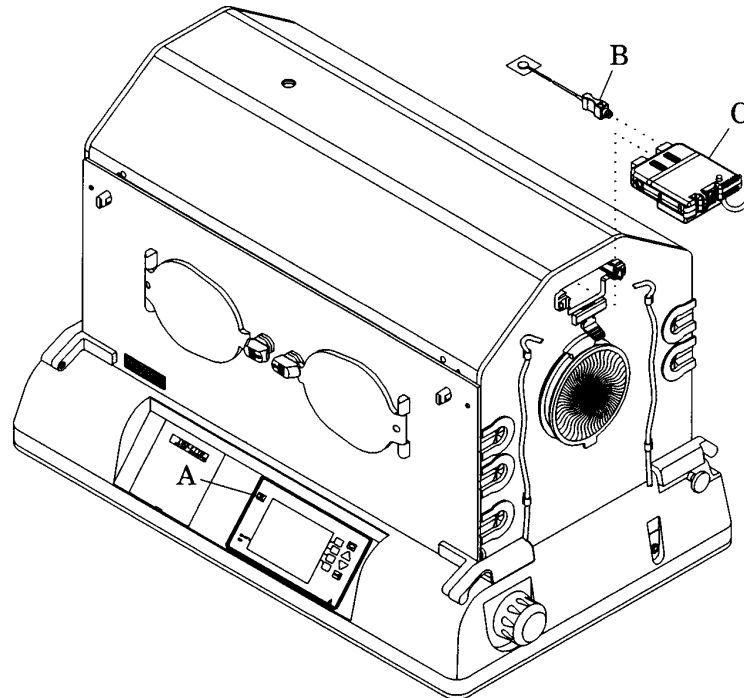
↓ → For assistance, call Technical Support at (800) 437-2437.

2. Go to “Final Actions” on page 2-22.

2.42 Skin 1 Probe Does Not Work Properly

1. Perform the following:
 - a. If the **Skin 1 Probe Fail** alarm sounds, press the **Silence/Reset** softkey (A) to silence it for 5 minutes.

Figure 2-37. Skin 1 Probe



m223g148

- b. Check the skin probe (B).

The skin probe (B) is securely attached to the infant's skin.

Yes **No**

↓

→ Securely attach the skin probe (B) to the infant's skin. If this solves the problem, go to "Final Actions" on page 2-22. Otherwise, go to step 5.

2. Disconnect the skin probe (B) from the 1 skin connector at the sensor module assembly (C). The **Skin Probe Disconnect** alarm sounds.

Yes **No**

↓

→ Go to step 5.

3. The unit is in Air Mode. Perform the following:

- a. Press the **Silence/Reset** softkey (A) to silence the **Skin Probe Disconnect** alarm.
- b. Set the unit in Skin Mode.

This solves the problem.

Yes	No
↓	→ Go to step 6.

4. Go to “Final Actions” on page 2-22.

5. Check the mode of operation. The unit is in Skin Mode.

Yes	No
↓	→ Set the unit in Skin Mode. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 6.

6. The **Connect Skin 1 Probe** alarm sounds.

Yes	No
↓	→ Go to RAP 2.38 on page 2-102. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 7.

7. Perform the following:

- a. Connect the skin probe (B) to the **1** skin connector on the sensor module assembly (C).
- b. Access the **System Test (1 of 3)** menu (see “Diagnostic Menus” on page 2-33). **Skin Probe 1** reads as **Connected**.

Yes	No
↓	→ Securely connect the skin probe (B) to the sensor module assembly (C). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 8.

8. Access the **Data Summary (1 of 2)** screen (see “Diagnostic Menus” on page 2-33). The **Skin 1 Temp** reads **0**.

Yes	No
↓	→ For assistance, call Technical Support at (800) 437-2437.

9. Replace the skin probe (B) (refer to procedure 4.1 on page 4-5). The problem still exists.

Yes	No
↓	→ Go to “Final Actions” on page 2-22.

10. Replace the sensor module assembly (C) (refer to procedure 4.2 on page 4-6). This solves the problem.

Yes No



→ For assistance, call Technical Support at (800) 437-2437.

11. Go to “Final Actions” on page 2-22.

2.43 Oxygen System Is Not Working Properly (Units Equipped With an Oxygen System Only)

1. The **Oxygen Solenoid Fail** alarm sounds.

Yes No

↓ → Go to step 3.

2. Replace the oxygen solenoid (refer to procedure 7.2 on page 7-8). The problem still exists.

Yes No

↓ → Go to “Final Actions” on page 2-22.

3. Perform the following:

- a. Press the **Silence/Reset** softkey to silence the **Oxygen Calibration Required** alarm for 5 minutes, if necessary.

- b. Calibrate the oxygen sensors (refer to procedure 6.2 on page 6-19).

The problem still exists.

Yes No

↓ → Go to “Final Actions” on page 2-22.

4. Replace the oxygen sensors (refer to procedure 7.2 on page 7-8). The problem still exists.

Yes No

↓ → Go to “Final Actions” on page 2-22.

5. For assistance, call Technical Support at (800) 437-2437.

2.44 Poor Air Circulation Exists Within the Incubator

1. Check the air vents around the interior of the hood assembly for obstruction. The air vents are free from obstruction.

Yes No

↓

→ Remove the obstruction from the air vents. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. Replace the fan motor (refer to procedure 4.9 on page 4-22). This solves the problem.

Yes No

↓

→ For assistance, call Technical Support at (800) 437-2437.

3. Go to “Final Actions” on page 2-22.

2.45 Sensor Module Assembly Fails

1. The sensor module is properly installed on the hood assembly.

Yes	No
↓	→ Go to RAP 2.22 on page 2-78. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.
2. The sensor module is properly connected to the unit.

Yes	No
↓	→ Go to RAP 2.21 on page 2-76. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 3.
3. Replace the sensor module assembly (refer to procedure 4.2 on page 4-6). This solves the problem.

Yes	No
↓	→ For assistance, call Technical Support at (800) 437-2437.
4. Go to “Final Actions” on page 2-22.

2.46 Remove Skin 2 Probe Alarm Sounds

1. Perform the following:
 - a. Disconnect the skin probe from the **2** connector on the sensor module assembly.
 - b. Check the unit's mode of operation.

The unit is in Air Mode.

Yes No

↓

→ Place the unit in Air Mode. If this solves the problem, go to "Final Actions" on page 2-22. Otherwise, call Technical Support at (800) 437-2437 for assistance.

2. Press the **Silence/Reset** key, and then enter Skin Mode. This solves the problem.

Yes No

↓

→ For assistance, call Technical Support at (800) 437-2437.

3. Go to "Final Actions" on page 2-22.

2.47 Scale Is Not Working Properly

1. Inspect the mattress tray (A) (see figure 2-38 on page 2-115). The mattress tray (A) is level.

Yes No

↓

→ Using the mattress tilt mechanism knobs (B), place the mattress tray (A) in the level position. If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 2.

2. The **Too Much Weight** alarm sounds.

Yes No

↓

→ Go to step 6.

3. Perform the following:

- a. Silence the **Too Much Weight** alarm for 5 minutes by pressing the **Silence/Reset** key (C).
- b. Remove the excess weight from the mattress (D).

The problem still exists.

Yes No

↓

→ Go to “Final Actions” on page 2-22.

4. The **Scale Disconnected** alarm sounds.

Yes No

↓

→ Go to step 6.

5. Go to step 10.

6. Perform the following:

- a. If you desire a pounds/ounces display, refer to “Installation and Set-up” on page 6-13.
- b. Remove any objects from the mattress (D).
- c. Select **Display 2**, and press the **Weigh** softkey.
- d. Press the **Zero** softkey twice in succession.

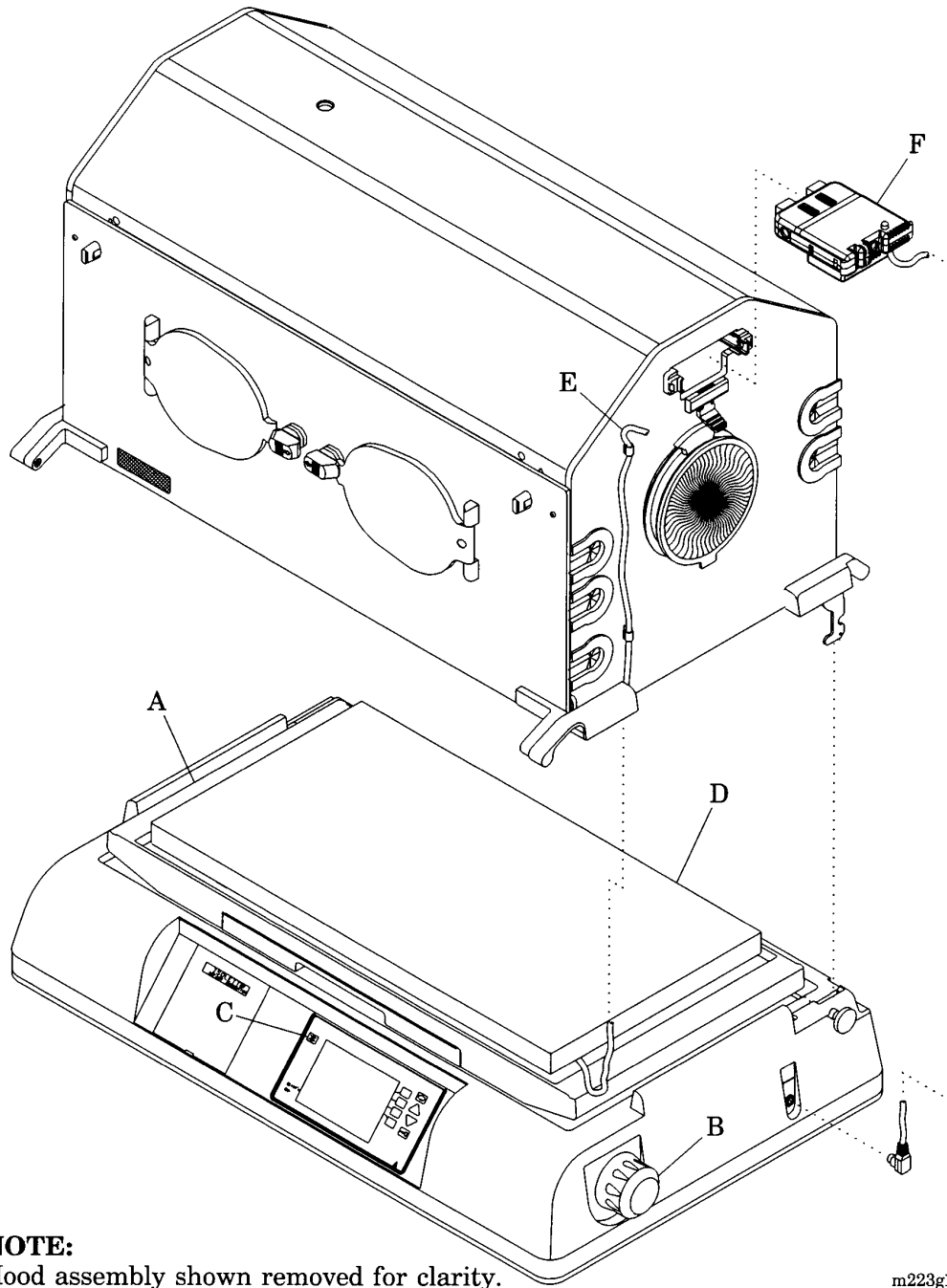
The **Weight** display reads **0**, and the **Weight Sample** bar begins to fill.

Yes No

↓

→ Remove all objects from the mattress (D). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 10.

Figure 2-38. Scale Assembly



NOTE:
Hood assembly shown removed for clarity.

m223g149

7. Place a weight of known value less than 15 lb (7 kg) on the mattress (D). The correct weight appears, and when the **Weight Sample** bar is filled, a beep sounds and the weight is locked into the **Weight** display.

Yes **No**
↓ → Go to step 10.

8. Perform the following:
- a. Press the **Home** key to return to **Display 2**.
 - b. Press the **Weigh** softkey.

The display again displays the value of the weight on the mattress (D).

Yes **No**
↓ → For assistance, call Technical Support at (800) 437-2437.

9. The problem still exists.

Yes **No**
↓ → Go to “Final Actions” on page 2-22.

10. Check the connection of the scale assembly cable (E) at the sensor module assembly (F). The scale assembly cable (E) is securely connected to the sensor module assembly (F).

Yes **No**
↓ → Securely connect the scale assembly cable (E) to the sensor module assembly (F). If this solves the problem, go to “Final Actions” on page 2-22. Otherwise, go to step 11.

11. Replace the sensor module assembly (F) (refer to procedure 4.2 on page 4-6). The problem still exists.

Yes **No**
↓ → Go to “Final Actions” on page 2-22.

12. Replace the scale assembly (refer to procedure 7.1 on page 7-5). This solves the problem.

Yes **No**
↓ → For assistance, call Technical Support at (800) 437-2437.

13. Go to “Final Actions” on page 2-22.

2.48 Oxygen System's *Cal Fail* System Prompt Message Appears

1. Calibrate the oxygen system (refer to procedure 6.2 on page 6-19). The problem still exists.

Yes No

↓

→ Go to "Final Actions" on page 2-22.

2. Attempt to calibrate the oxygen system again (refer to procedure 6.2 on page 6-19). The problem still exists.

Yes No

↓

→ Go to "Final Actions" on page 2-22.

3. For assistance, call Technical Support at (800) 437-2437.

2.49 Controller Failure #15—Invalid Parameter in NVRAM

1. Reset the system configuration settings to the desired settings (Go to “Entering the System Configuration Menu” on page 2-33).
2. Go to “Final Actions” on page 2-22.

2.50 Controller Failure #16—NVRAM Integrity Failure

1. Reset the system configuration settings to the desired settings (Go to “Entering the System Configuration Menu” on page 2-33).
2. Go to “Final Actions” on page 2-22.

2.51 Controller Failure #17—Non-volatile RAM Parameter Consistency Check Failure

1. Reset the system configuration settings to the desired settings (Go to “Entering the System Configuration Menu” on page 2-33).
2. Go to “Final Actions” on page 2-22.

Chapter 3

Theory of Operation

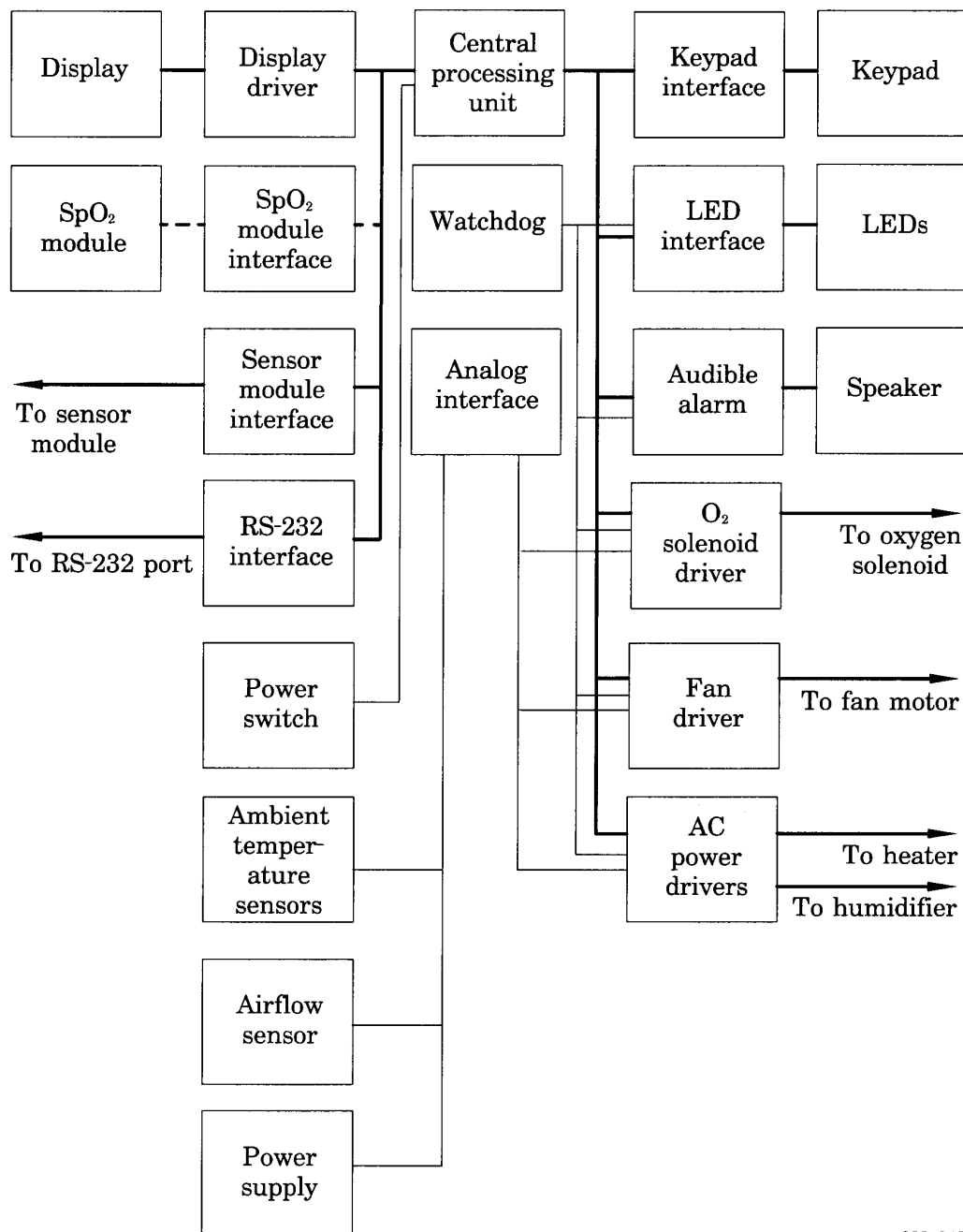
Chapter Contents

Controller Assembly	3 - 3
Variable Height Adjustable Pedestal/Stand Assembly	3 - 7
Hood/Shell Assembly	3 - 8
Theory of Operation	3 - 17
Electrical System	3 - 17
Sensor Module	3 - 17
Controller	3 - 21
Impeller Movement Detector (IMD) P.C. Board	3 - 22
Fan Motor	3 - 23
Heater Power.	3 - 24
Humidity Heater Power	3 - 24
Air System	3 - 28
Overall Functional Description.	3 - 28
Air Mode.	3 - 30
Skin Mode.	3 - 31
Oxygen Control.	3 - 31
Humidity Control Valve	3 - 32
Hardware.	3 - 32
Weighing Mode	3 - 32
Trend Displays	3 - 32
Interface Connections	3 - 33
RS-232 Serial Port Protocol	3 - 34

NOTES:

Controller Assembly

Figure 3-1. Controller Assembly Block Diagram



m223g042

Figure 3-2. Controller Power Supply Schematic Diagram

Refer to fold-out FO 3-1 at the rear of this manual.

Figure 3-3. Interface P.C. Board Schematic Diagram

Refer to fold-out FO 3-2 at the rear of this manual.

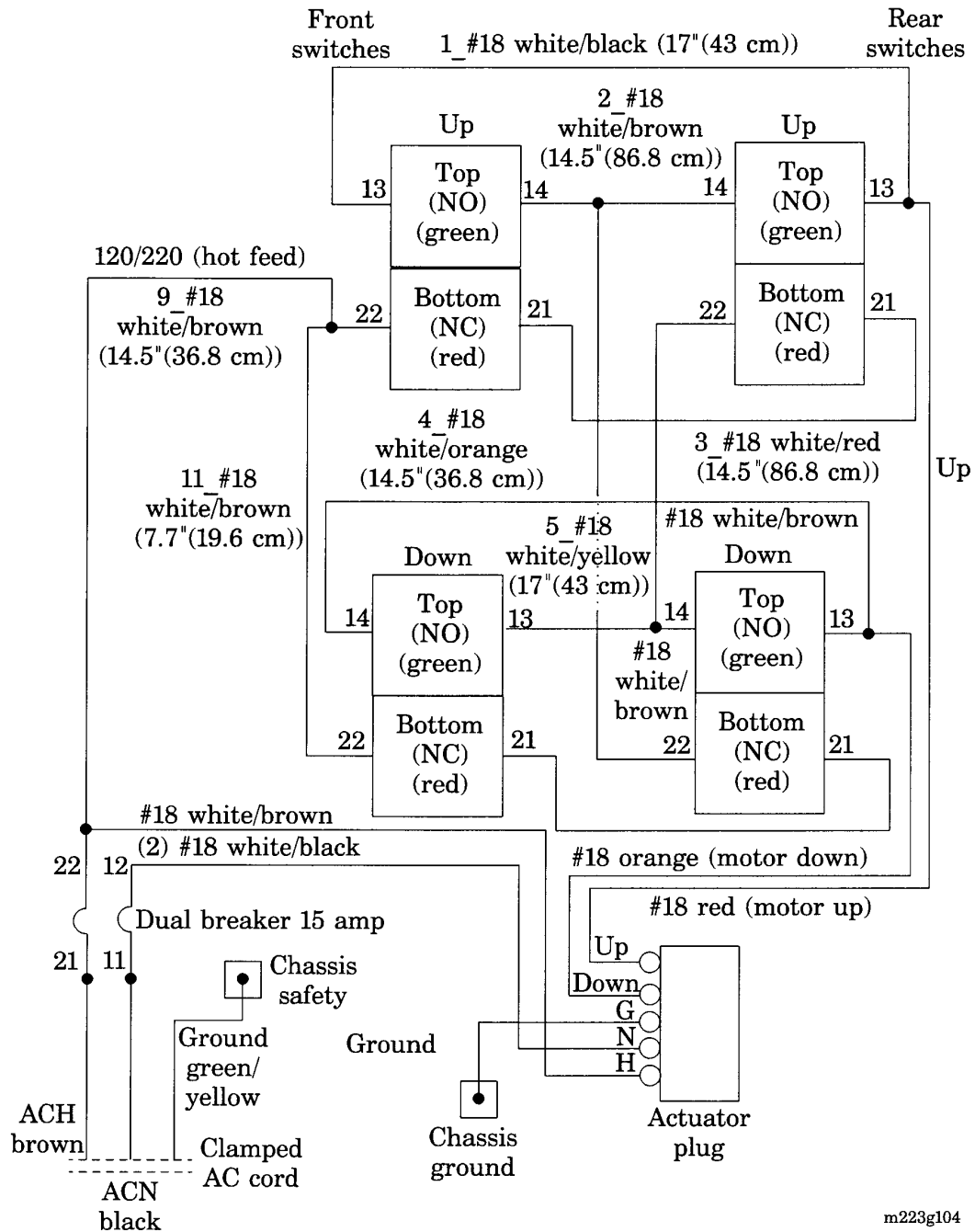


Figure 3-4. Central Processing Unit P.C. Board Schematic Diagram

Refer to fold-out FO 3-3 at the rear of this manual.

Variable Height Adjustable Pedestal/Stand Assembly

Figure 3-5. Variable Height Adjustable Pedestal/Stand Assembly Wiring Diagram



Hood/Shell Assembly

Figure 3-6. Sensor Module Functional Block Diagram

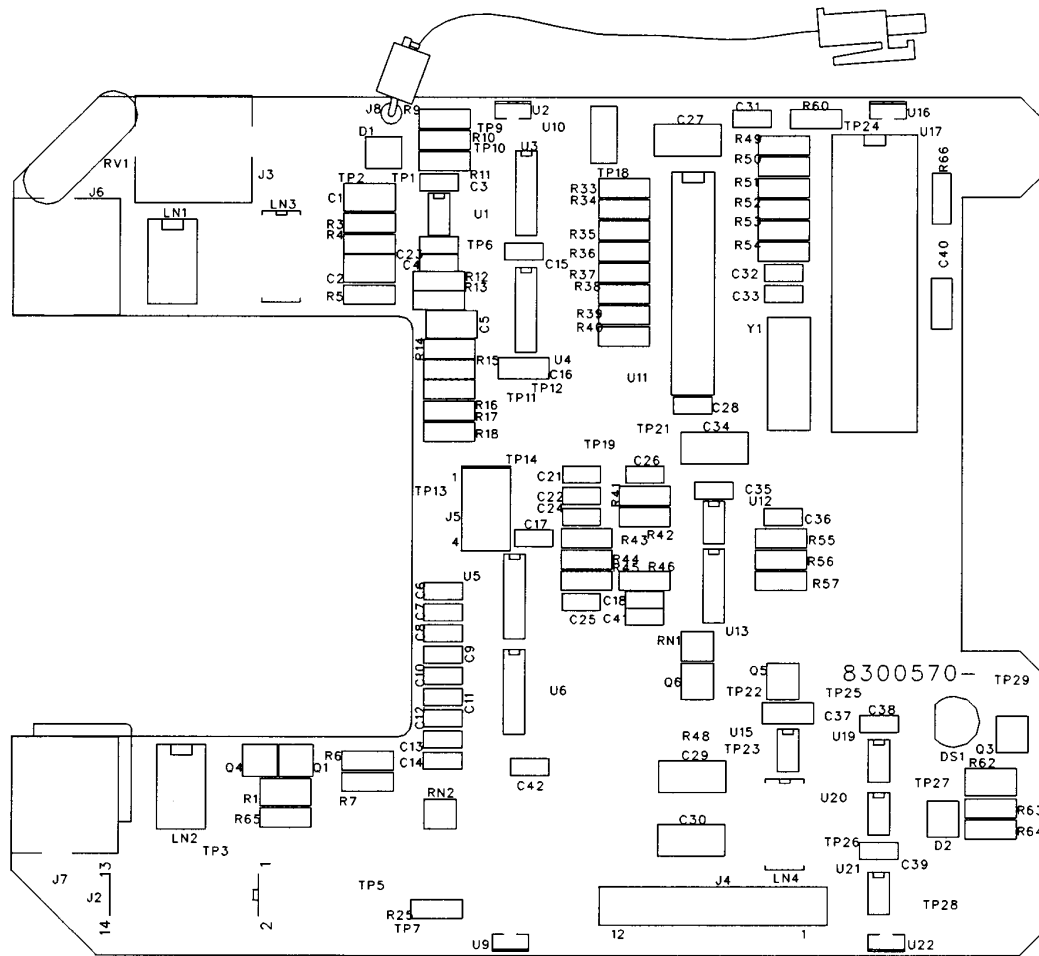
Refer to fold-out FO 3-4 at the rear of this manual.

Figure 3-7. Sensor Module P.C. Board Schematic Diagram

Refer to fold-out FO 3-5 at the rear of this manual.



Figure 3-8. Sensor Module P.C. Board Layout



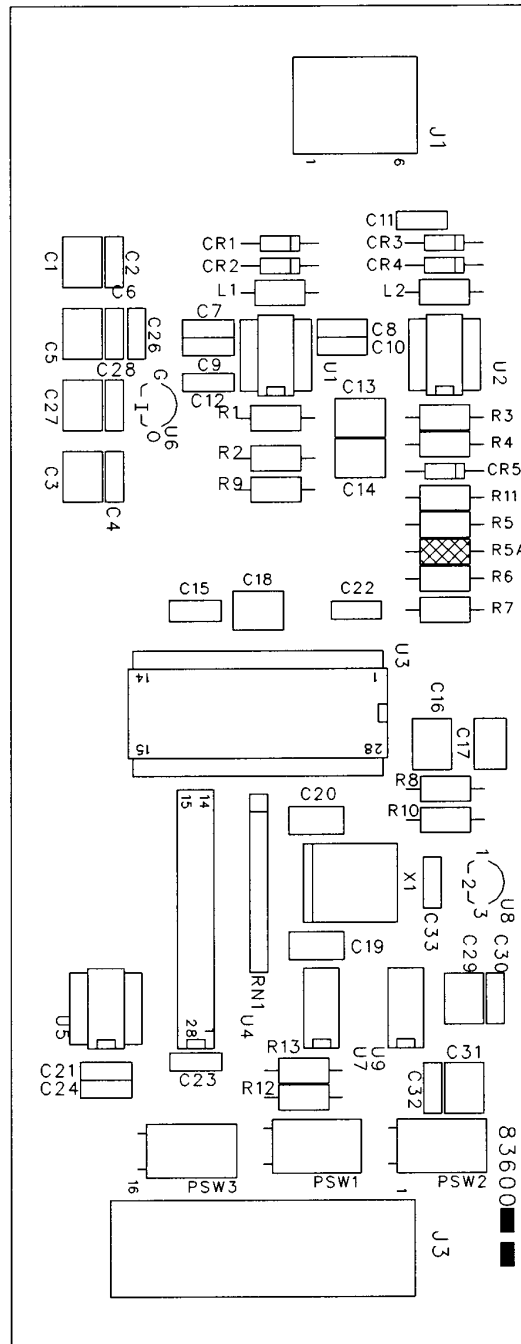
m223g052

Figure 3-9. Scale P.C. Board Schematic Diagram

Refer to fold-out FO 3-6 at the rear of this manual.



Figure 3-10. Scale P.C. Board Layout



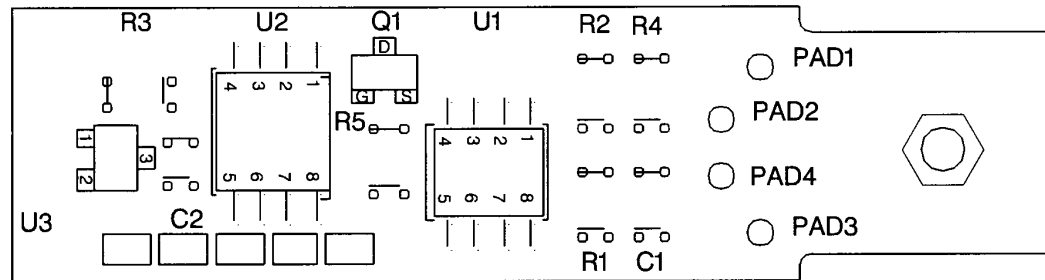
m223g077

Figure 3-11. Impeller Movement Detector P.C. Board Schematic Diagram

Refer to fold-out FO 3-7 at the rear of this manual.



Figure 3-12. Impeller Movement Detector P.C. Board Layout



m223g202

Figure 3-13. Shell Assembly Cable Routing

Refer to fold-out FO 3-8 at the rear of this manual.



Figure 3-14. Scale Assembly Cable Routing

Refer to fold-out FO 3-9 at the rear of this manual.

Theory of Operation

Electrical System

Sensor Module

The sensor module P.C. board provides the interface for the patient and incubator requirements that the infant incubator must support. The sensor module assembly reads and processes the following parameters:

- Temperature
- Oxygen
- Humidity
- Weight information, collected from external sensors and cables

This information is periodically updated and transmitted to the main controller upon request.

The sensor module P.C. board does **not** require manual calibration. Calibration performs automatically and periodically during normal operation. To provide safe monitoring and control, both the temperature information and oxygen information have redundant circuitry to prevent single-fault failures.

All signals are transmitted through serial data communication.

The sensor module connects to a sensor P.C. board that has the following parameters required for the system:

- Air temperature
- Oxygen
- Humidity
- Fan operation

Power Supply

The power to the sensor module P.C. board is provided through connector J4, providing $\pm 12\text{V}$ AC for the system. U21, U19, and U15 regulate the voltages by providing +5V, digital +5V and analog -5V, respectively. U20 provides a precision +5V source for analog signal conversions.

Sensor Position Detection

Hall effect sensors sense the magnets in the slide mechanism. The sensors, U9 and U2, determine the calibration position. The sensors, U16 and U22, determine the hood's position during normal operation. The output is normally **high**. These devices provide a **low** output if a significant south pole magnetic field is applied to their surface.

Remote Light Alarm Indicator

DS1 provides an alarm indication with a high field of view. A positive signal, RMLITE, at the gate of transistor Q3 illuminates DS1.

Scale Interface

The connector J3 provides the interface and power for the scale module. The scale module supports serial data communication. The signal SCCLK is used for scale communication only and is normally high when the scale is disconnected. The signal CDATE is bi-directional and is normally in the low state when the scale is not connected.

Fan Control/Feedback Circuit

To drive the DC fan on the sensor board, the signal FANON pulses Q1 on its gate at a 50% duty cycle at approximately 48 Hz to maintain proper speed and to increase fan life. Every 4 seconds, the microcontroller asserts FANON for 42 milliseconds, and the fan pulse detection begins.

U1A handles the pulse detection and, through the resistors R3 and R7, samples the current spikes from the fan produced across R1. The amplifier operates as a differentiator, providing high gain for the current spikes. D1 and C16 then rectify and filter this signal and then feed it to the Analog/Digital (A/D) converter as signal FANPUL. This provides a semi-DC level as a function of the fan rotation.

Temperature Measurement

The temperature data acquisition circuit starts with the analog multiplexers, U6 and U5, each allowing an 8-to-1 signal switching. The microcontroller selects the multiplexer channel by the signals MSEL0, MSEL1, and MSEL2. Each multiplexer output can be inhibited by either signal TM1SEL or TM2SEL, depending on the multiplexer; only one multiplexer is active at a time. With each multiplexer output into the amplification under control, this data acquisition is viewed as a 16-to-1 analog temperature selector. The microcontroller selects a new temperature channel every 21 milliseconds.

The resistor R14 provides the constant voltage drive required for each thermistor as it is selected from the appropriate multiplexer. This voltage is amplified by a factor of 2.1083, and is sent to the A/D converter as signal TCOM.

To provide automatic calibration of the circuit and eliminate temperature and aging drifts, R44 and R45 introduce precise calibration values into each multiplexer. These values are read through the multiplexers and are used in software processing to eliminate the gain and offset errors of each multiplexer/amplifier combination. These values equate to 120.87°F (49.37°C) and 72.72°F (22.62°C), which allow for precise circuit calibration.

Resistor R43 is an additional check to the circuit, which provides a resistance simulating 98.57°F (36.98°C).

The sensor module supports the following three air temperature sensors on the sensor board:

- AIRTE
- AIRTC
- AIRTM

These signals interface through J2-6 to J2-8. The thermistors then route to temperature multiplexers U5 and U6, which provide analog signal processing into the A/D converter.

The skin temperature probes contain dual thermistors. The sensor module supports two probes that plug into connectors J6 and J7. The two thermistors connect to SKNT1M and SKNT1C or SKNT2M and SKNT2C, with a common connector at AGND. Both probes have high frequency filtering by inductor networks LN1 and LN2. In addition, each skin probe has a resistor that is input to the multiplexers. The microcontroller uses these signals, SKNT1D and SKNT2D, to determine if the probes are installed.

Humidity Measurement

Humidity measurement originates with the humidity sensor on the sensor P.C. board, connected to J2-5 and J2-14 (AGND and HS2, respectively). The sensor is a capacitive-type that changes capacitance as a function of humidity; the net range of capacitances is from approximately 160 pF to 200 pF. The sensor connects to the amplifier U7A/U8A, which is set up as a multi-vibrator. The sensor capacitance charges up through R20 and R21 to a threshold voltage established by R30 and R26.

When the capacitor voltage reaches the threshold, the capacitor U7A/U8A goes high to 2.5V as controlled by R19 and R28, and turns on Q2. This discharges the humidity sensor through R20 until it reaches the lower threshold established by R24, R26, and R30. The capacitor voltage goes from approximately 0.2V to 0.7V. At this point, the comparators output goes low, releasing the drive to Q2 and allowing the humidity to start charging again. This produces a frequency output as a function of capacitance, such as humidity.

The output signal, which is only 2.5V peak, is then input into U7B/U8B to condition the 5V signal. Hysteresis is provided through the use of R23, R29, and R32 to ensure stable frequency switching. The output signal, JUMPUL, is then sent to the microcontroller for processing. A typical frequency would be around 37 KHz.

Microcontroller

The microcontroller is a Priority-Interrupt Controller (PIC) 16C73, used for signal-processing and for control of all signals on the sensor module. The device has three external ports, configurable as inputs and outputs. The microcontroller operates from a precise time-base of crystal Y1, operating at 4 MHz. The instruction cycle time of the PIC is $\frac{1}{4}$ of that, namely at 1 MHz or 1 microsecond.

To ensure a clean power-up, U10 provides a fixed power-up reset to the microcontroller. This integrated circuit also generates a reset in the event of a brownout condition when the D+5 falls below a predetermined threshold.

If the main controller determines that the sensor module requires reset intervention, the reset line of the microcontroller, SMRES, is available to the main controller.

The PIC device operates with an internal watchdog timer device that asserts SMRES if the program execution operates outside normal conditions.

Expansion Devices

The digital multiplexer, U3, allows additional digital signals for processor control. It is a dual, 4-to-1 multiplexer that allows the microcontroller to use two ports for 8-bits of information. The signals, DVSEL0 and DVSEL1, control U18.

The buffered line-drivers, U13A/B and U14A, are used for signals that are going off-board, namely SMDATA, SCDATA, and SCCLK. The SMDATA line is used as a bi-directional line that can change from input or output “on-the-fly” for data communication to the main controller. The SCDATA is similar, with connection to the scale at connector J3. SCCLK is the buffered clock line used for scale communications.

Buffer U14B provides an inversion for TM1SEL, producing TM2SEL to alternately enable and disable the temperature multiplexers.

Analog/Digital (A/D) Conversions

The A/D converter, U11, is an eight-channel, 12-bit, serial, interface device. Control for the channels is software-configurable by the serial communication line SSPCLK, ADCDIN, and COMOUT. The signal, ACENI, enables the A/D converter for signal processing and is asserted twice every 21 milliseconds; the A/D converter is read twice. In addition, the ADCIN and COMOUT are driven at 21 millisecond intervals. The SSPCLK is shared with the EEPROM on the sensor board and scale clock; therefore, the timing is not periodic.

All temperature information appears as a multiplexed signal on Channel 0, and oxygen information appears as a multiplexed signal on Channel 2. Channel 4 enables the A/D converter to read its maximum input, and Channel 5 enables the A/D converter to read its minimum input to determine proper A/D functioning.

The analog representation of fan pulses apply to Channel 6.

Controller

The controller accepts input voltages between the range of 90V AC and 264V AC through a universal input switching power supply. Voltages above the safe operating range are clamped using a transorb diode.

The controller accepts input frequencies between the range of 48 Hz to 62 Hz through a universal input switching power supply.

The stand supplies the input power and protective ground to the controller and incorporates a 15A circuit breaker and electromagnetic interference (EMI) filtering components.

The controller provides AC power to the heater and the humidifier. These outputs are fused in the controller to protect the controller in the event of a short circuit or electrical overload.

- Maximum heater voltage—264V AC
- Maximum heater current—4.8A
- Maximum humidifier voltage—264V AC
- Maximum heater current—1.2A
- Heater/humidifier fuse rating—6.3A

The controller provides DC power to the following:

- The fan
- The sensor module
- The scale
- The SPO₂ module, if available
- The airflow sensors
- The door switches

These outputs are current-limited in the controller to protect the controller and the powered device if a circuit shorts or electrically overloads. These outputs are regulated to ensure the output voltage is within the voltage specification for the powered device. The microprocessor feeds and monitors the outputs 1 and 2 into the A/D converter.

Impeller Movement Detector (IMD) P.C. Board

The Impeller Movement Detector (IMD) P.C. board is positioned so that magnets pressed into the bottom of the impeller pass directly over a Hall effect sensor mounted to the IMD P.C. board. The IMD circuit monitors the Hall effect sensor's pulse train, produced by the magnets when the impeller rotates. The speed of the impeller is measured and compared with the pre-determined maximum and minimum acceptance limits. If the impeller's rotational speed is too fast or too slow, an impeller error signal generates. The IMD circuit also detects if one, two, or all three magnets are missing or if an old impeller without magnets is used. These errors produce the same error signal to the controller as for low or high impeller speeds.

The controller's +12V supplies the power for the IMD circuit through a 301 Ω resistor. This resistor and the load of the IMD circuit form a voltage divider that sets the LONG signal voltage that remains constant. U1, a voltage regulator, supplies +5V DC to the Hall effect sensor (U3) and the microcontroller (U2). As the magnets pass above the Hall effect sensor, its open-drain output, U3-2, goes low, detecting the magnets' field. When the magnets' field is removed, the oscillator is used as a reference. When an error condition is detected, U2-2, the microcontroller's output, drives low, which accomplishes the following:

- Turns off Q1.
- Releases a portion of the load on the short signal, allowing it to rise above the LONG signal voltage.

R2, the switch portion of the SHORT signal load, and R4, the unswitch position of the SHORT signal load, adjust to provide an approximate 1V swing between the error and non-error outputs. The capacitors, C1 and C2, filter the system's supply.

The IMD P.C. board supports in-circuit programming (ICP) of the microcontroller. Programming is done after the unprogrammed microcontroller is populated with all the other components by connecting a programmer to the pads labeled VPP, +5V, CLK, DTA, and GND.

Fan Motor

The controller sets the fan motor speed if the watchdog is not tripped. The microprocessor supplies a pulse-width modulation (PWM) signal to an optocoupler for isolation. The output connects to an integrator circuit that converts the PWM signal to an analog signal for the motor controller. The motor incorporates the Hall effect sensors for monitoring and control. One of the Hall effect sensor outputs is fed to the microprocessor for measuring the motor speed. If the watchdog timer trips, the fan motor speed is maintained at 1500 rpm \pm 450 rpm.

The controller provides an alarm to indicate a failure of the fan to rotate. When this occurs, the heater and humidifier disable, and an audible alarm with a visual indication activates.

Heater Power

The controller monitors the heater power. A current transformer is in series with the power to the heater and the humidifier. The output of the current transformer connects to the A/D converter.

The system enables control of the incubator's heater. The microprocessor controls a solid state relay that controls the power to the heater. The microprocessor and the watchdog circuit control the safety relay, K3. The release of the safety relay removes power from the heater regardless of the functionality of the heater triac.

Humidity Heater Power

The controller monitors the humidity heater power. A current transformer is in series with the power to the heater and humidifier. The output of the current transformer connects to the A/D converter.

The system enables control of the humidity heater. The microprocessor controls a solid state relay that controls the power to the humidity heater. The microprocessor and the watchdog circuit control the safety relay, K3. The release of the safety relay removes power from the humidifier heater regardless of the functionality of the humidity heater triac.

Oxygen Control

The system enables control of the oxygen pneumatics. The microprocessor provides a PWM signal to the solenoid's metal oxide semiconductor field-effect transistor (MOSFET).

The voltage to the oxygen solenoid is monitored and fed into the A/D converter. This circuit monitors the 12V power supply and thermal fuse.

Light-Emitting Diodes (LEDs)

The microprocessor drives each light-emitting diode (LED). The hardware watchdog timer circuit drives the alarm/system fail indicator. The power fail detection circuitry drives the **Power Fail** indicator.

Audio Alarms

The audible alarm circuit incorporates an oscillator circuit to generate the three alarm frequencies used:

- 600 Hz
- 1500 Hz
- 2500 Hz

The microprocessor, the watchdog circuit, and the power failure detection circuitry drive the audible alarm circuit.

The audio volume is capable of three discrete sound levels. An analog switch, incorporated in the audible alarm amplifier circuit, selects a 57 dB, 62 dB, or 65 dB output, as measured by International Electrotechnical Commission (IEC) 601-19-2:102.3. The microprocessor, the watchdog circuit, and the power failure detection circuit control the analog switch.

Power Fail

The controller provides an audio output for power fail conditions. The alarm oscillator is set for 600 Hz at 65 dB output, as measured by IEC 601-19-2:102.3. A timer circuit generates the cadence tone during power failures.

When a **Power Failure** alarm is activated, the following occurs:

- The **Power Fail** indicator on the front panel illuminates.
- An alarm sounds.

A high energy storage capacitor powers the power failure detection circuitry and supplies power to the audible alarm and indicator for a minimum of 10 minutes. This capacitor charges while the unit is operating. When power is lost to the controller and the **Power** switch remains in the **On** position, the storage capacitor supplies power to the power failure circuitry. The power failure circuitry incorporates a timer circuit that periodically enables the audible alarm and **Power Fail** indicator at a cadence of 520 milliseconds off and 98 milliseconds on until one of the following occurs:

- The **Power** switch is turned off.
- The power is restored.
- The storage capacitor is depleted.

The **Power Failure** alarm silence is hardware-controlled. Pressing the **Alarm Silence** key during power failure silences the alarm for the duration of the power failure. The **Power Fail** indicator flashes until one of the following occurs:

- The storage capacitor is depleted.
- The **Power** switch is turned off.
- The power is restored.

The **System Failure** alarm is unaffected by the **Alarm Silence** key.

Interfacing

An interface port enables an RS-232 serial communication link. The serial port is fully isolated from the remaining controller circuitry. The power to the serial port interface circuitry derives from an isolated winding on the power supply transformer. The RS-232 interface connector is a female DB-9, mounted on the rear of the controller. An RS-232 transceiver converts the RS-232 to logic voltage levels and vice versa. Optocouplers provide the isolation barrier and interface the RS-232 transceiver to the PC16550 UART. The UART interfaces the serial port to the microprocessor bus. All lines connected to the RS-232 connector are filtered to block EMI. The RS-232 transceiver incorporates electrostatic discharge (ESD) protection.

An interface enables communication between the controller module and the sensor module. The sensor module interface connector is a female DB-9, mounted on the rear of the controller and comprised of a bi-directional data line, a clock output line, and a reset output line. The data lines are fully isolated and optocoupled to the microprocessor. The controller provides isolated power to the sensor module.

Door Switches

The controller connects to the two door switches that are wired in parallel. The controller performs the following:

- Provides no more than 5 milliamperes (mA) of current to the switches
- Provides less than 6V of power to the switches
- Monitors the return current to determine if either door is open

The switches are open when the door is closed. The input is protected with transorb diodes and is filtered to block EMI and prevent ESD damage to the controller.

Cooling Fan

The cooling fan provides a continuous flow of air through the controller to remove heat generated by the various components inside the controller enclosure. The cooling fan operates whenever power is applied to the controller. The cooling fan is equipped with a tachometer output signal that is supplied to the microprocessor.

Ambient Temperature Sensors

The temperature sensors, located in the airflow of the cooling fan, are NTC thermistors. The output signals of the redundant sensors feed into the A/D converter.

Watchdogs

The first watchdog timer is internal to the microprocessor. If the software does not update the watchdog timer within the required time frame, the internal watchdog resets the microprocessor and all peripherals connected to the external reset line.

The second watchdog timer circuit attaches to the microprocessor bus. The microprocessor continuously writes the following data to the watchdog timer:

- Data 55 hex (01010101 binary) to watchdog register #1.
- Data AA hex (10101010 binary) to watchdog register #2.

The watchdog timer trips in 1 second \pm 0.4 second unless the above sequence is completed. Once the watchdog timer trips, the following occurs:

- The safety relay turns off, removing power from the heater and the humidifier.
- The fan control reverts to closed loop control, maintaining a constant fan speed regardless of the door's position.
- The oxygen solenoid control from the microprocessor is overridden, and the oxygen solenoid turns off so that no oxygen enters the hood.
- A constant alarm sounds for a minimum of 500 milliseconds.
- The system failure indicator illuminates.

The microprocessor resets the watchdog timer after a watchdog trip by sending the above data sequence.

Factory Defaults

Factory defaults are stored in program memory, flash EEPROM. System parameters are configured and stored in the real time clock (RTC) module or serial EEPROM. The RTC memory and random access memory (RAM) are protected against corruption during power failures and are battery-backed for a period of time.

The program is stored in reprogrammable memory and may be reprogrammed through a cable connected to the serial port of a computer. The program memory is stored in a flash EEPROM. The RS-232 serial port operates at speeds of 115,200 baud to expedite the speed of the program download.

Power Supply

The power supply is so designed that 1 second after disconnection of the plug, the voltage between the supply pins of the plug and between either supply pin and the enclosure does not exceed 60V by using a bleeder resistor across the mains filter capacitor, if necessary.

Air System

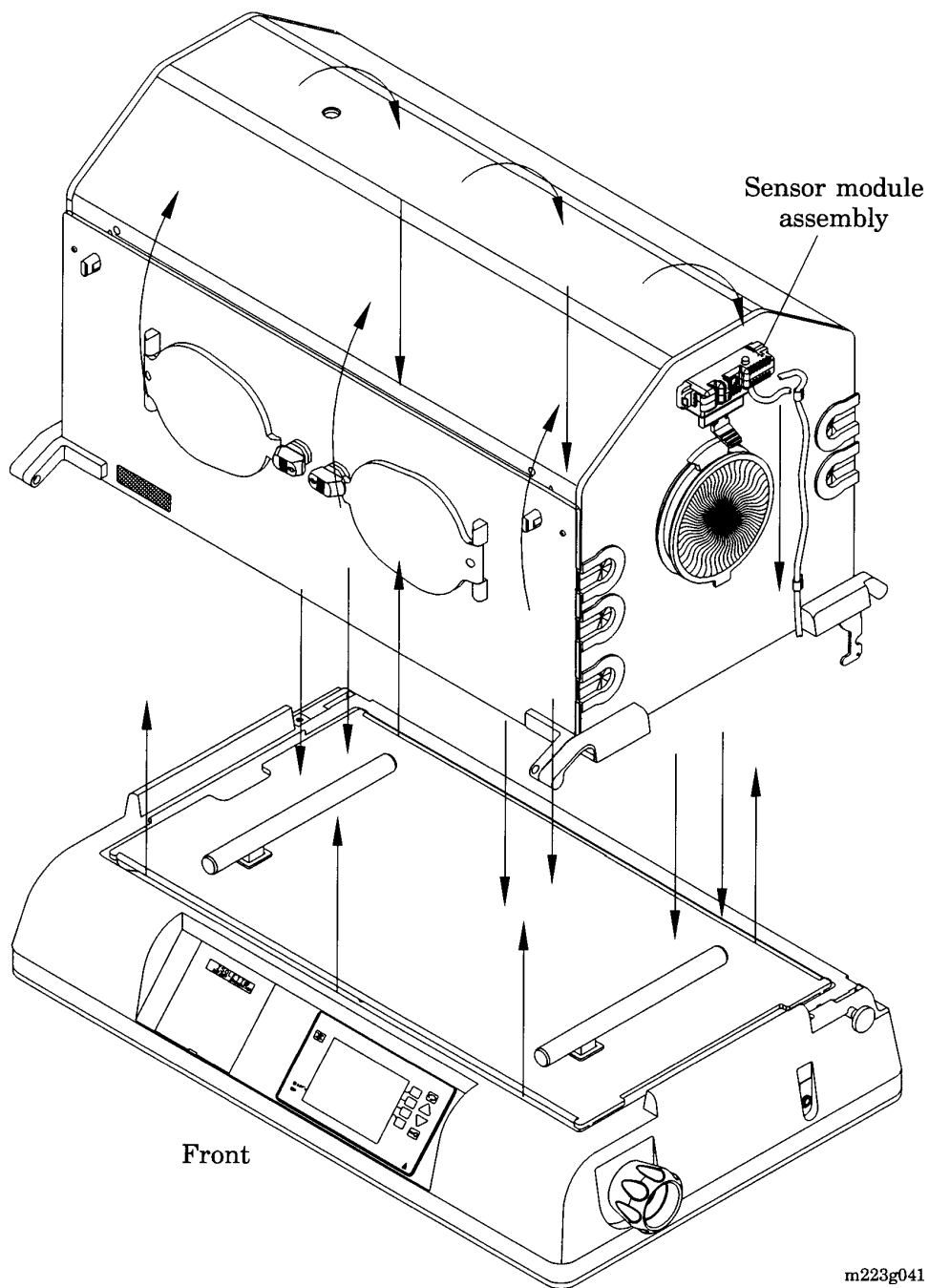
Overall Functional Description

The controller displays the air temperature and the skin temperature on an electroluminescent display. Optional displays of the humidity and oxygen concentration levels within the hood environment and the infant's weight are available. In addition, Trend displays of 2, 4, 8, 12, and 24 hours of all parameters (except weight, which is presented in days) are user-selectable.

To indicate which mode of operation, Air Mode or Skin Mode, is in control, the set temperature of the controlling parameter remains on adjacent to the actual displayed temperature. In addition, the rotating wheel in the **Air** or **Skin** softkey designator rotates.

The forced air circulation system controls the temperature, humidity, and oxygen concentration (see figure 3-15 on page 3-29). The motor-driven impeller in the shell draws a controlled amount of approximately 7 liters per minute (lpm) of room air through the air intake filter.

Figure 3-15. Air/Oxygen Circulation System



The impeller also provides the internal circulation at a much greater flow than that of the fresh gas inflow. The total flow of fresh and circulated air is directed past the airflow sensor and around the heater. The air enters the infant compartment up through the slots at the front and rear of the main deck and then passes between the front and rear inner walls. The air circulates past the sensor module, which contains the temperature sensing probe that encapsulates the air temperature control thermistor and a high air temperature alarm thermistor. After circulating within the infant compartment, the air then re-circulates down through a slot in the right end of the main deck, and back to the impeller. When the access panel of the hood is open, the air continues to flow upward past the opening, creating a warm air curtain to minimize the drop in air temperature in the incubator. The temperature is regulated using either the incubator's air or the infant's skin temperature as the controlling parameter; the desired mode is selected by the front panel keys.

In either mode of operation, the heater output is proportional to the amount of heat required to maintain the desired temperature.

Air Mode

In Air Mode, the air temperature is maintained from 68°F to 99°F (20°C to 37°C) (99°F to 102°F (37°C to 39°C) in Temperature Override Mode), as selected by the **Air Set Temperature** Up and Down arrow keys on the front panel. A probe located in the sensor module monitors the incubator's air temperature and compares it with the air's set temperature setting. The probe supplies this information to the heater control circuitry, which regulates the heater output to maintain the air temperature setting. The actual air temperature appears on the **Air Temperature** display. A second sensor within the air temperature probe serves as a backup to limit the maximum incubator temperature. If the high temperature limit activates, the heater shuts off.

In Air Mode, the infant's temperature is a function of the air temperature and the infant's ability to establish and maintain its own temperature. A small infant, or one with underdeveloped homeostatic control, may not be able to maintain a stable temperature at the desired level.

In Air Mode, there is a 15-minute setpoint retention. When you first power the unit on, the air setpoint temperature is 95°F (35°C); for example, if you change the air setpoint temperature to 95.9°F (35.5°C), and a power failure occurs, the air set temperature comes up to 95.9°F (35.5°C) if the unit turns on again before 15 minutes elapse.

Skin Mode

In Skin Mode, the infant's temperature is selected from 93°F to 99°F (34°C to 37°C) (99°F to 100°F (37°C to 38°C) in Temperature Override Mode) by the **Skin Set Temperature** Up and Down arrow keys on the front panel. A temperature sensing probe attaches directly to the infant's skin. The probe supplies information to the heater control circuitry, which proportions the heater output to maintain the skin set temperature.

The air temperature still appears in Skin Mode, but as information only. If Air Mode is selected while the skin probe remains connected, the **Skin Temperature** display continues to display actual skin temperature, but it does not control.

The sensor module accepts two skin probes. However, when the second skin probe connects to the sensor module in Skin Mode, an alarm sounds, and the message **Remove Skin 2 Probe** appears. To connect the second skin probe, first select Air Mode. The controller then displays the two temperatures.

If Skin Probe 1 disconnects from its receptacle during Skin Mode, the **Skin Temperature** display goes blank, an alarm sounds, and the heater turns off.

Oxygen Control

An oxygen sensor assembly mounted inside the sensor module adjusts the flow of oxygen into the hood and controls the oxygen concentration level within the incubator's hood environment.

A valve regulates the flow into the incubator and periodically interrupts the flow of oxygen into the incubator.

The sensor module houses two independent oxygen fuel cells that monitor and control the oxygen concentration levels inside the incubator.

If the sensor module is outside of the hood environment during Oxygen Mode, audible and visual alarms are enabled, and the flow of oxygen is interrupted.

In Oxygen Mode, the user sets the oxygen level control point from 21% to 65%. The high and low alarm limits automatically set to $\pm 3\%$ from the control point. If the oxygen concentration level rises above or falls below the selected setpoint limits, an audible and visual alarm occurs.

Humidity Control Valve

The built-in humidifier provides humidification of the incubator from 30% to 95% RH in 1% increments. The humidifier reservoir permits visual inspection of the water level.

If the water level in the chamber is depleted, an audible and visual **Low Humidity** alarm occurs, indicating a need to replenish the water supply.

Hardware

Weighing Mode

Two load cells in a platform under the mattress perform the actual weighing function. These cells provide a voltage that is proportional to the load on it. The controller processes the voltage and displays it in either kilograms or pounds/ounces on the **Weight** display.

The weighing routine is initiated by placing the infant on the mattress. If the infant is already on the mattress, lift the infant off the mattress; when the system zeros, return the infant to the mattress to obtain the weight.

The **Weigh** key enables repeated weighing of the infant after the weighing routine is initiated as described above.

Trend Displays

Four standard parameters are presented on Trend displays:

- Air temperature
- Skin temperature #1
- Skin temperature #2
- Heater power

Additional Trend displays are available when the unit is equipped with any of the following options:

- Oxygen
- Weight
- Humidity

The Trend time is user-selectable in intervals of 2, 4, 8, 12, and 24 hours for all parameters, except for weight, which provides a trend of 7 days.

Interface Connections

A serial interface port is configured as a data terminal device and provides an RS-232 output. This RS-232 port can be used to connect the device to a bedside patient monitor or a central monitoring system using the VueLink™¹ system software functionality to view the following parameters:

The following parameters are available:

- Air and skin setpoint temperatures
- Current air and skin temperatures
- Oxygen setpoint
- Oxygen level
- Humidity setpoint
- Humidity level
- Infant weight

1. VueLink™ is a trademark of Philips Medical Systems.

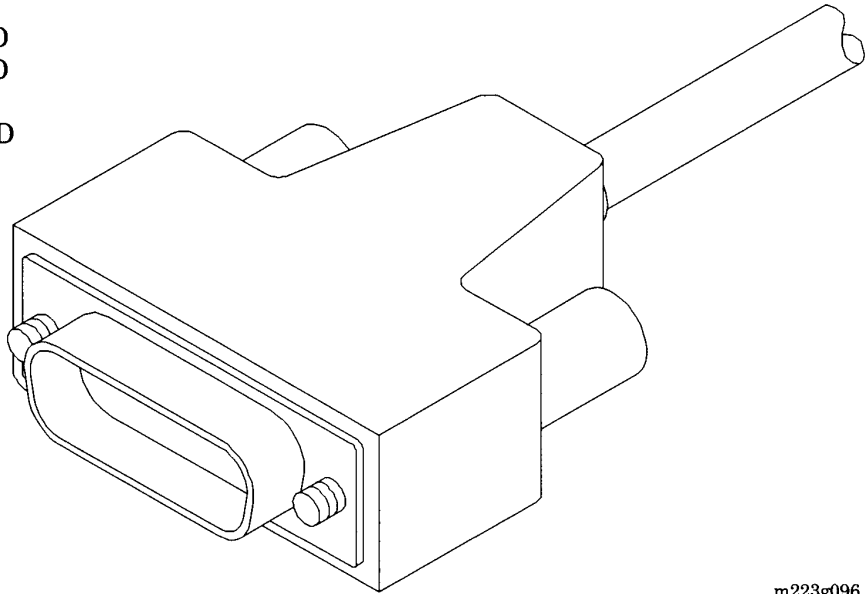
RS-232 Serial Port Protocol

The RS-232 serial port connector is next to the AC power connector on the front of the incubator. The serial port is configured for 2400 baud, 8 data, 1 stop, no parity, and is output only (see figure 3-16 on page 3-34).

Figure 3-16. RS-232 Connector Pin Outs

RS-232 port connector
9-pin D-female

- 1 NC
- 2 RXD
- 3 TXD
- 4 NC
- 5 GND
- 6 NC
- 7 NC
- 8 NC
- 9 NC



m223g096

During normal operation, a data packet transmits every 5 seconds. Each data packet is entirely in American Standard Code Information Interchange (ASCII) and is readable when displayed on any standard RS-232 terminal device. A data packet consists of one 82-character line of text that is composed of a prefix, a data portion, a suffix, a checksum, and a carriage return/line feed (CR/LF) pair.

The prefix identifies the data line. It consists of an opening bracket and an ID character that are unique to the data line. The format of the data portion depends on the specific data line. Any character positions within the data portion that are undefined transmit as spaces to enhance the readability of the output. The suffix property limits the data portion and consists of a closing bracket.

The checksum is two ASCII hexadecimal digits and represents an 8-bit acclamation of the ASCII characters from the prefix to the suffix, inclusive.

All monitored parameters, including temperature, oxygen, humidity, and weight, transmit at the 5-second interval. Asynchronous events, such as alarms or mode changes, transmit as they occur.

Example of the data string:

```
0000000001111111112222222222333333333344444444445555555555666
123456789012345678901234567890123456789012345678901234567890123
[ ISOLETTE 000000000000 361A 385 387 360 220 050 76 75 21 21 1245 ]8D
```

Table 3-1. RS-232 Serial Port Protocol

Columns	Description
1 and 2	Prefix: 2 characters, '[' followed by the ID character (see table 3-2 on page 3-36)
4 through 11	Product ID: 8 characters
13 and 14	Mode bit flags: 2 hexadecimal digits (see table 3-3 on page 3-36)
15 through 24	Alarm bit flags: 10 hexadecimal digits (see table 3-4 on page 3-37)
26 through 28	Setpoint temperature: 3 digits, 1 decimal, Celsius
29	Air/Skin Mode: 1 character "A or B"
31 through 33	Skin temperature 1: 3 digits, 1 decimal, Celsius
35 through 37	Skin temperature 2: 3 digits, 1 decimal, Celsius
39 through 41	Air temperature: 3 digits, 1 decimal, Celsius
43 through 45	Ambient temperature: 3 digits, 1 decimal, Celsius
47 through 49	Heater power: 3 digits, range 0 to 250
51 and 52	Humidity: 2 digits, 0 decimal
54 and 55	Setpoint humidity: 2 digits
57 and 58	Oxygen: 2 digits, 0 decimal
60 and 61	Setpoint oxygen: 2 digits
63 through 66	Weight: 4 digits, 3 decimals, kilograms
78	Suffix: 1 character, '['
79 and 80	Checksum: 2 hexadecimal digits
81 and 81	CR/LF: 2 control characters

Table 3-2. ID Character

Character	Description
<space>	Normal mode
1	Special/Test Mode is in effect (data may be invalid)

Table 3-3. Mode Bit Flags

Bit	Description
01	Humidity on
02	Oxygen on
04	Baby Mode configuration
08	0.5°C baby alarm limit
10	Reserved
20	Reserved
40	Reserved
80	Reserved

For example: If “Humidity on” and “Baby Mode configuration” are selected, the character is **05**.

Table 3-4. Alarm Bit Flags

Bit	Description
0000000001	Low control temperature
0000000002	High control temperature
0000000004	Low oxygen
0000000008	High oxygen
0000000010	High temperature cut-out
0000000020	Skin 1—probe failure
0000000040	Skin probe—disconnect
0000000080	Oxygen calibration required
0000000100	Sensor out of position
0000000200	Water level low
0000000400	Procedural Silence
0000000800	Motor failed
0000001000	Low air flow
0000002000	Heater failed
0000004000	EEPROM failed
0000008000	Sensor module failure
0000010000	Controller failure 1
0000020000	Controller failure 2
0000040000	Controller failure 3
0000080000	Controller failure 4
0000100000	Air probe failed
0000200000	Oxygen cell different
0000400000	Scale disconnect
0000800000	Too much weight
0001000000	Scale failed

For example: If the air temperature and oxygen are low and Procedural Silence is initiated, such as when an access door is open, the 10 character value equals **000000405**.

Certain fields, such as air temperature, have an implied decimal point. The decimal point does not physically appear in the data stream.

NOTES:

Chapter 4

Removal, Replacement, and Adjustment Procedures

Chapter Contents

Skin Temperature Probe	4 - 5
Removal	4 - 5
Replacement	4 - 5
Sensor Module Assembly	4 - 6
Removal	4 - 6
Replacement	4 - 7
Oxygen Sensor Cell	4 - 8
Removal	4 - 8
Replacement	4 - 9
Controller Assembly	4 - 10
Removal	4 - 10
Replacement	4 - 10
Hood Assembly	4 - 12
Removal	4 - 12
Replacement	4 - 12
Check Valve Assembly	4 - 14
Removal	4 - 14
Replacement	4 - 16
Mattress, Mattress Tray, and X-ray Tray	4 - 17
Removal	4 - 17
Replacement	4 - 18

Impeller Assembly	4 - 19
Removal	4 - 19
Replacement	4 - 20
Motor Assembly	4 - 21
Removal	4 - 21
Replacement	4 - 24
Access Panel	4 - 26
Removal	4 - 26
Replacement	4 - 28
Adjustment	4 - 29
Iris Entry Port Sleeve	4 - 30
Removal	4 - 30
Replacement	4 - 30
Access Door Latch	4 - 32
Removal	4 - 32
Replacement	4 - 34
Access Door and Access Door Pivot Hinges	4 - 35
Removal	4 - 35
Replacement	4 - 36
Electroluminescent (EL) Display Front Panel	4 - 38
Removal	4 - 38
Replacement	4 - 39
Electroluminescent (EL) Central Processing Unit (CPU) P.C. Board, EL Display Faceplate, and EL Display	4 - 40
Removal	4 - 40
Replacement	4 - 41
Controller Fan Assembly	4 - 42
Removal	4 - 42
Replacement	4 - 43
Interface/Power Supply Module	4 - 44
Removal	4 - 44

Replacement	4 - 45
Power Supply P.C. Board Assembly and Interface P.C. Board Assembly.....	4 - 46
Removal	4 - 46
Replacement	4 - 47
Air Intake Microfilter	4 - 48
Removal	4 - 48
Replacement	4 - 48
Heater Assembly.....	4 - 49
Removal	4 - 49
Replacement	4 - 51
Impeller Movement Detection Sensor	4 - 52
Removal	4 - 52
Replacement	4 - 54
AC Wiring Harness Assembly	4 - 55
Removal	4 - 55
Replacement	4 - 57
Sensor Module-To-Controller Cable Assembly	4 - 59
Removal	4 - 59
Replacement	4 - 61
Access Panel Pawl Latch and Knob Assembly	4 - 63
Removal	4 - 63
Replacement	4 - 64
Iris Entry Port Retaining Rings.....	4 - 66
Removal	4 - 66
Replacement	4 - 66
Access Door Cuff	4 - 67
Removal	4 - 67
Replacement	4 - 67
Access Door Gasket	4 - 69
Removal	4 - 69
Replacement	4 - 69

Chapter 4: Removal, Replacement, and Adjustment Procedures

Pivot/Hook Lock Assembly Bracket	4 - 70
Removal	4 - 70
Replacement	4 - 71
Heat Shield Latch	4 - 73
Removal	4 - 73
Replacement	4 - 74
Heat Shield	4 - 75
Removal	4 - 75
Replacement	4 - 76
Mattress Tilt Knob	4 - 77
Removal	4 - 77
Replacement	4 - 80
Mattress Tilt Mechanism	4 - 83
Removal	4 - 83
Replacement	4 - 86
Sensor Module Lock (Models with Sensor Module Lock Only)	4 - 87
Removal	4 - 87
Replacement	4 - 88
Access Grommet	4 - 89
Removal	4 - 89
Replacement	4 - 90
Upper Transition Plate	4 - 91
Removal	4 - 91
Replacement	4 - 91

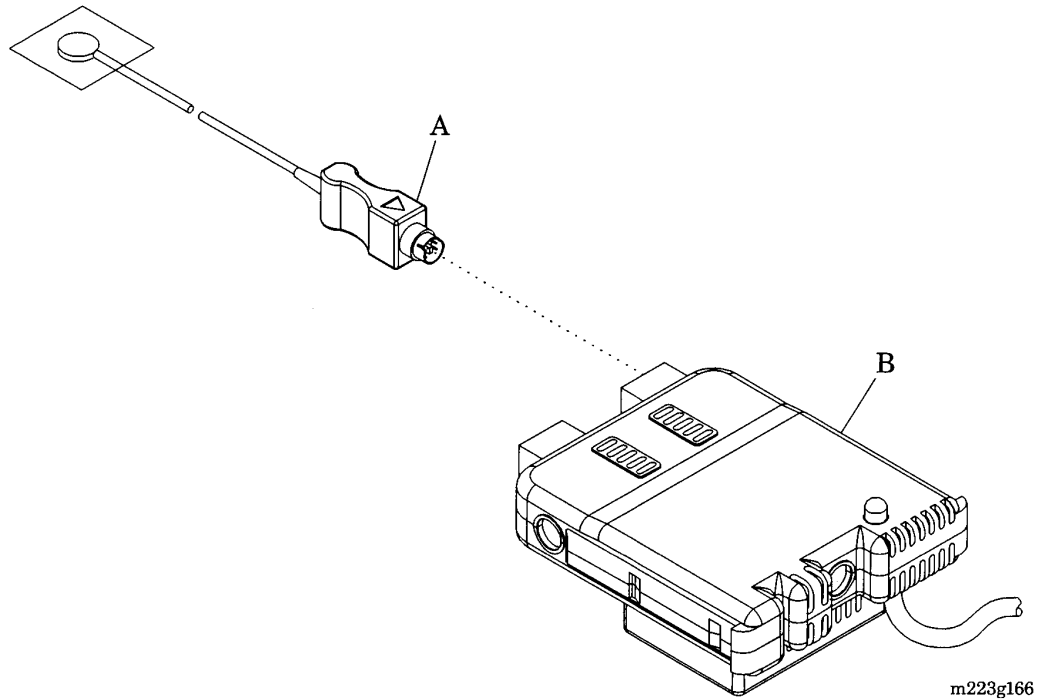
4.1 Skin Temperature Probe

Tools required: None

Removal

Disconnect the skin temperature probe (A) from the sensor module assembly (B) (see figure 4-1 on page 4-5).

Figure 4-1. Skin Temperature Probe



Replacement

1. Perform the removal procedure in reverse order.
2. To ensure proper operation of the Isolette® Infant Incubator, perform the "Function Checks" on page 2-6.

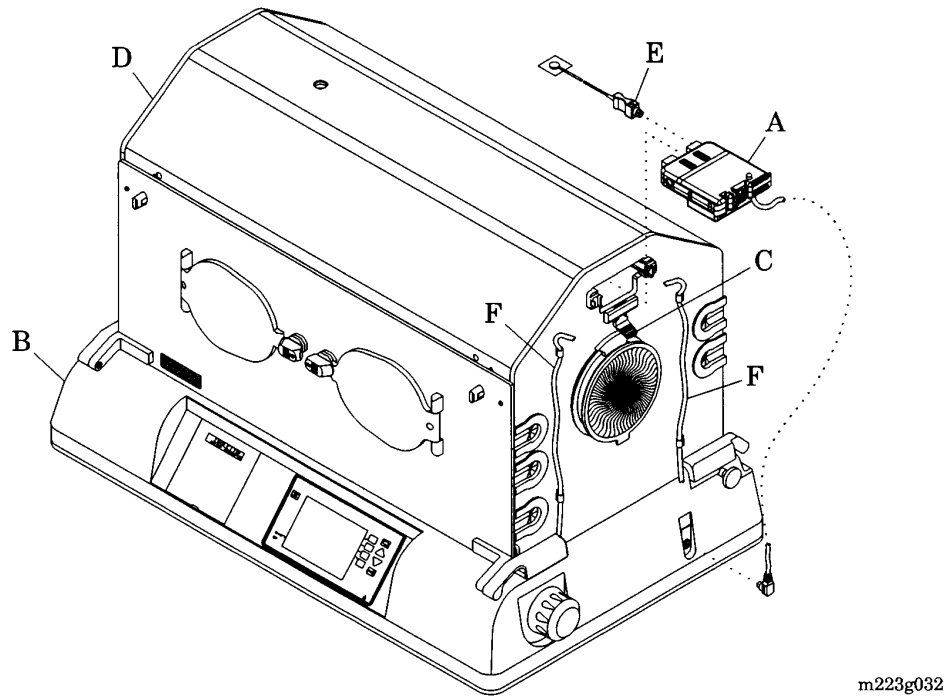
4.2 Sensor Module Assembly

Tools required: None

Removal

1. Disconnect the sensor module assembly (A) from the shell assembly (B) (see figure 4-2 on page 4-6).

Figure 4-2. Sensor Module



2. If the unit is equipped with a sensor module locking assembly (C), lower it.
3. Withdraw the sensor module assembly (A) from the hood assembly (D) until it stops.
4. Pull out the clip on the left side of the sensor module assembly (A), and slide the sensor module assembly (A) out of the hood assembly (D).
5. If necessary, disconnect any skin temperature probes (E) from the sensor module assembly (A) (refer to procedure 4.1 on page 4-5).
6. If necessary, disconnect any cable assemblies from the sensor module assembly (A).

Replacement

1. Perform the removal procedure in reverse order.
2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

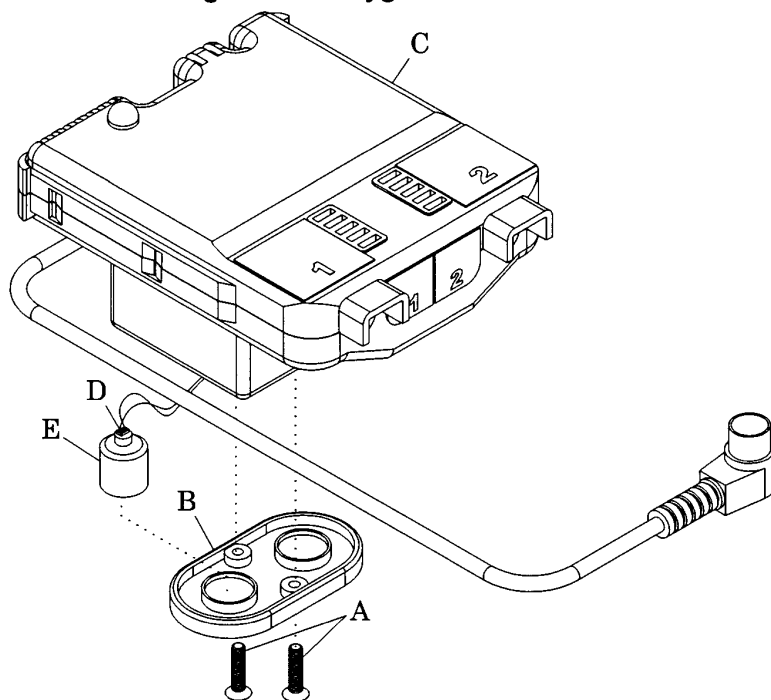
4.3 Oxygen Sensor Cell

Tools required: Phillips head screwdriver

Removal

1. Remove the sensor module assembly from the unit (refer to procedure 4.2 on page 4-6).
2. Remove the two screws (A) that secure the mounting plate (B) to the bottom of the sensor module assembly (C) (see figure 4-3 on page 4-8).

Figure 4-3. Oxygen Sensor Cell



m223g033

3. Remove the mounting plate (C) from the sensor module assembly (A).
4. Disconnect the leads (D) from the two oxygen sensor cells (E).



CAUTION:

Replace **both** oxygen sensor cells at the same time. Failure to do so could result in equipment damage.

5. Unscrew the two oxygen sensor cells (E) from the mounting plate (B), and remove them **both** from the unit.

Replacement

1. Screw both replacement oxygen sensor cells (E) on the mounting plate (B).
2. Connect the leads (D) of the sensor module assembly (C) to the two oxygen sensor cells (E).
3. Install the two screws (A) to secure the mounting plate (B) to the sensor module assembly (C).
4. Install the sensor module assembly in the hood assembly (refer to procedure 4.2 on page 4-6).
5. Calibrate the oxygen system (refer to procedure 6.2 on page 6-19).
6. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

4.4 Controller Assembly

Tools required: None

Removal



SHOCK HAZARD:

Unplug the unit from its power source. Failure to do so could result in personal injury or equipment damage.

1. Unplug the unit from its power source.
2. From under the shell assembly (A), perform the following (see figure 4-4 on page 4-11):
 - a. Disconnect the AC power cord from its connector (B) on the back of the controller assembly (C).
 - b. If necessary, disconnect the cable attached to the RS-232 port (D).
 - c. Remove the two wing nuts (E) located next to the AC power connector (B) and the RS-232 port (D).
3. Slide the controller assembly (C) out from the shell assembly (A) until its cable connectors are visible.
4. Disconnect the cables from the controller assembly (C).
5. Remove the controller assembly (C) from the shell assembly (A).

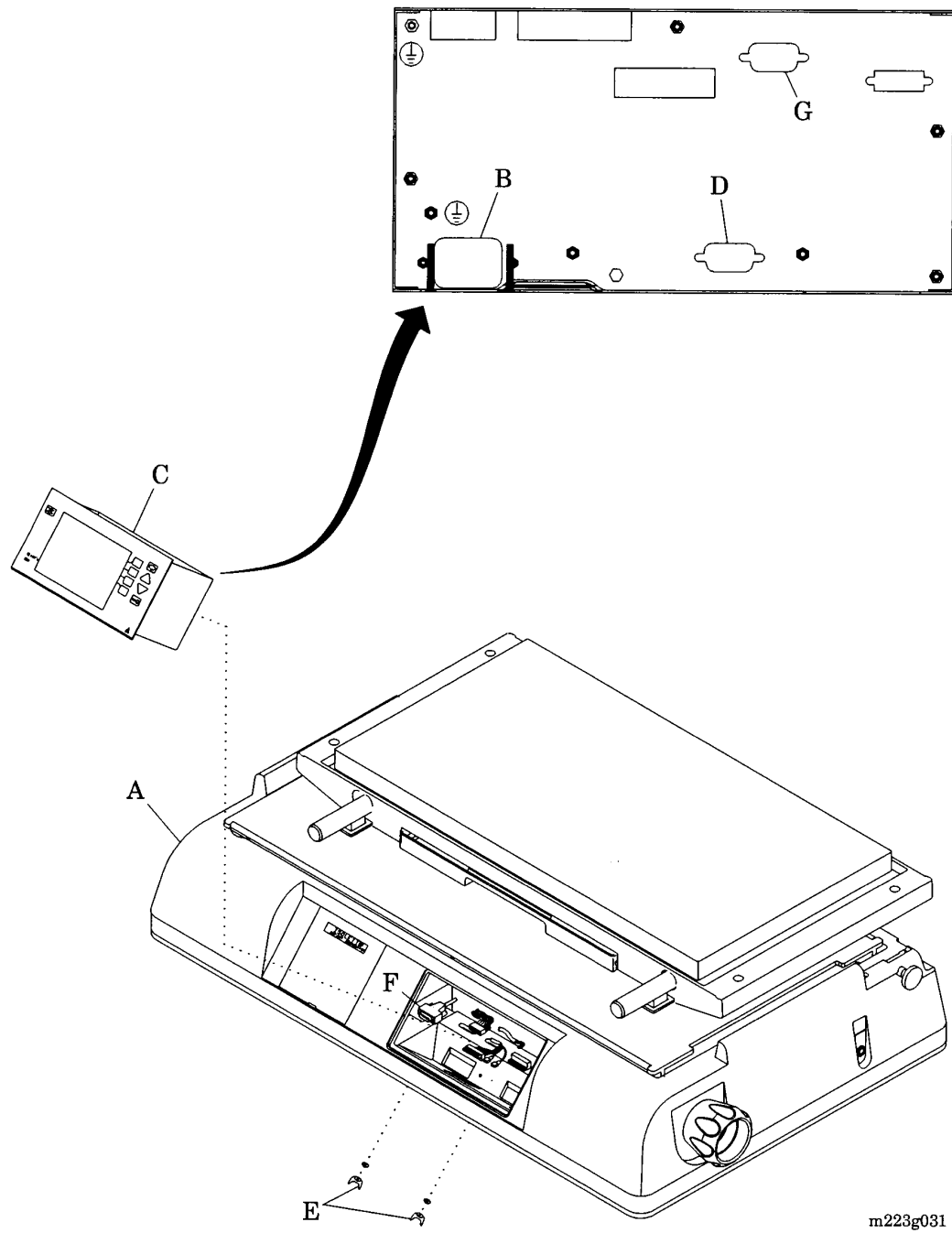
Replacement



CAUTION:

When reconnecting the rear panel connectors, connect the sensor module-to-connector cable assembly to the sensor module connector **only**. Do **not** connect the sensor module cable to the RS-232 connector. Equipment damage could occur.

1. Perform the removal procedure in reverse order. When connecting the cables to the controller assembly (C), connect the sensor module-to-controller cable assembly (F) to the sensor module connector (G), **not** the RS-232 port (D).
2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

Figure 4-4. Controller

m223g031

4.5 Hood Assembly

Tools required: None

Removal



SHOCK HAZARD:

Unplug the power cord from the controller assembly. Failure to do so could result in personal injury or equipment damage.

1. Unplug the power cord from the back of the controller assembly (A) (see figure 4-5 on page 4-13).
2. Remove the sensor module assembly from the hood assembly (refer to procedure 4.2 on page 4-6).
3. Remove the scale connector cable (B) from the cable clamps (C) on the end of the hood assembly (D).
4. Remove the controller assembly from the shell assembly (refer to procedure 4.4 on page 4-10).
5. Tilt the hood assembly (D) back until it is fully open.



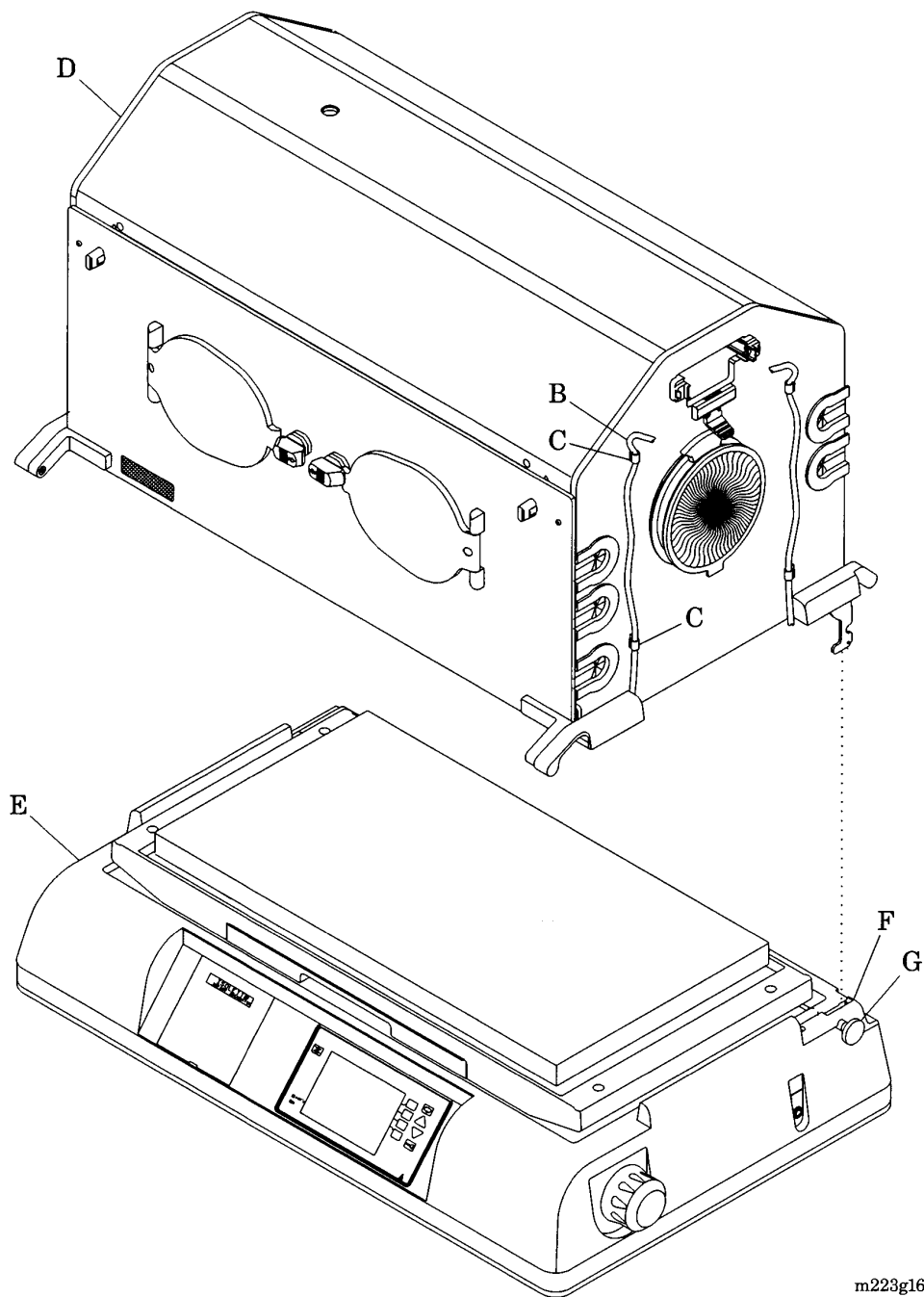
WARNING:

Two people are required to lift the hood assembly. Failure to use at least two people could result in personal injury or equipment damage.

6. Stand one person behind the incubator at each end of the hood assembly (D), and have each person lift their end of the hood assembly (D) straight up from the shell assembly (E). If the shell assembly (E) is equipped with a latching mechanism (F), the person at that end of the hood assembly (D) **must** release the knob (G) while lifting.
7. Carefully remove the hood assembly (D) from the unit.

Replacement

1. Perform the removal procedure in reverse order.
2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

Figure 4-5. Hood Assembly

m223g164

4.6 Check Valve Assembly

Tools required: Phillips head screwdriver
12" long wooden prop
Pliers

Removal



SHOCK HAZARD:

Unplug the power cord from the controller assembly. Failure to do so could result in personal injury or equipment damage.

1. Unplug the power cord from the controller assembly (A) (see figure 4-6 on page 4-15).
2. Remove the four Nylok® screws (B) that secure the shell bottom (C) to the shell assembly (D). **Discard** the four Nylok® screws (B).
3. Remove the extrusion bumper (I) from between the shell assembly (D) and the shell bottom (C).
4. Stand at the same end of the shell assembly (D) as the controller assembly (A), and perform the following:
 - a. Using the mattress tilt knob (E) and the rear hood hinge (F), lift the shell assembly (D).
 - b. Insert a 12" long wooden prop between the shell assembly (D) and the shell bottom (C).
5. Using pliers, disconnect the three hoses from the existing check valve assembly (J).
6. Remove the air intake microfilter cover (G) (refer to procedure 4.19 on page 4-48).
7. Remove the Nylok® screw (H) that secures the check valve assembly (J) to the shell bottom (C). **Discard** the Nylok® screw (H).
8. Remove the check valve assembly (J) from the shell bottom (C).

1. Nylok® is a registered trademark of Nylok Fastener Corporation.

This exploded view diagram illustrates the assembly of the HP-5000A power supply unit. The main chassis (top) features a fan, ventilation slots, and a control panel (A) with a digital display and buttons. The front panel (I) is shown being attached to the chassis. The internal components (bottom) include a transformer (J), capacitors, and other electronic parts mounted on a PCB. The front panel assembly (bottom right) shows the front panel (G) being attached to the internal components (H) using screws (B). The diagram is labeled with letters A through J, corresponding to the parts list.

Replacement



CAUTION:

Always replace Nylok® screws; do **not** reuse them. Equipment damage could occur.

1. Install a new Nylok® screw (H) to secure the replacement check valve assembly (J) to the shell bottom (C).
2. Connect the three hoses to the replacement check valve assembly (J).



CAUTION:

Use caution when lowering the shell assembly in place on the shell bottom. Ensure that no cables are pinched and that the extrusion bumper fits properly. Failure to do so could result in equipment damage.

3. Stand at the same end of the shell assembly (D) as the controller assembly (A), and perform the following:
 - a. Remove the 12" long wooden prop from between the shell assembly (D) and the shell bottom (C).
 - b. Carefully lower the shell assembly (D) in place on the shell bottom (C).
 - c. Ensure that no cables are pinched between the shell assembly (D) and the shell bottom (C).
 - d. Ensure that the extrusion bumper (I) fits properly between the shell assembly (D) and the shell bottom (C).



CAUTION:

Always replace Nylok® screws; do **not** reuse them. Equipment damage could occur.

4. Install four new Nylok® screws (B) to secure the shell bottom (C) to the shell assembly (D).
5. Install the air intake microfilter cover (G) on the unit (refer to procedure 4.19 on page 4-48).
6. To ensure proper operation of the Isolette® Infant Incubator, perform the "Function Checks" on page 2-6.

1. Nylok® is a registered trademark of Nylok Fastener Corporation.

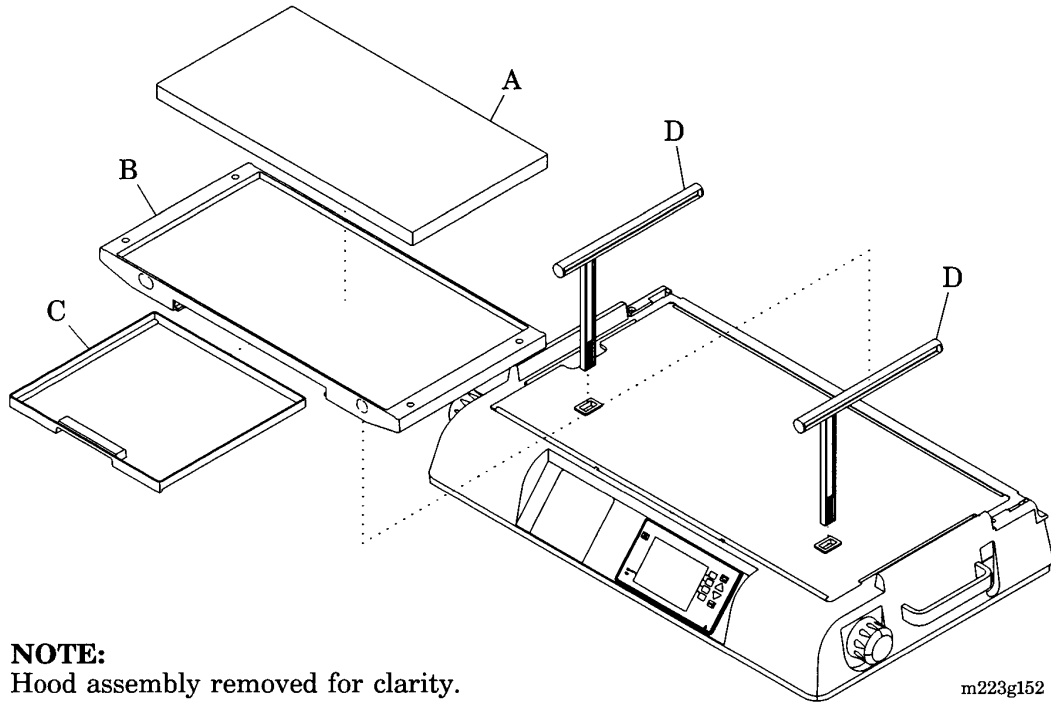
4.7 Mattress, Mattress Tray, and X-ray Tray

Tools required: None

Removal

1. Lift the hood assembly, and carefully tilt it back to its open position.
2. Remove the mattress (A) from the mattress tray (B) (see figure 4-7 on page 4-17).

Figure 4-7. Mattress Platform Assembly



NOTE:

Hood assembly removed for clarity.

3. If necessary, remove the mattress tray (B) and the x-ray tray (C) from the unit.
4. If necessary, remove the x-ray tray (C) from the mattress tray (B).

Replacement

1. Perform the removal procedure in reverse order. Ensure that the mattress tray (B) aligns with the mattress lift bars (D).
2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

4.8 Impeller Assembly

Tools required: Pliers

Removal

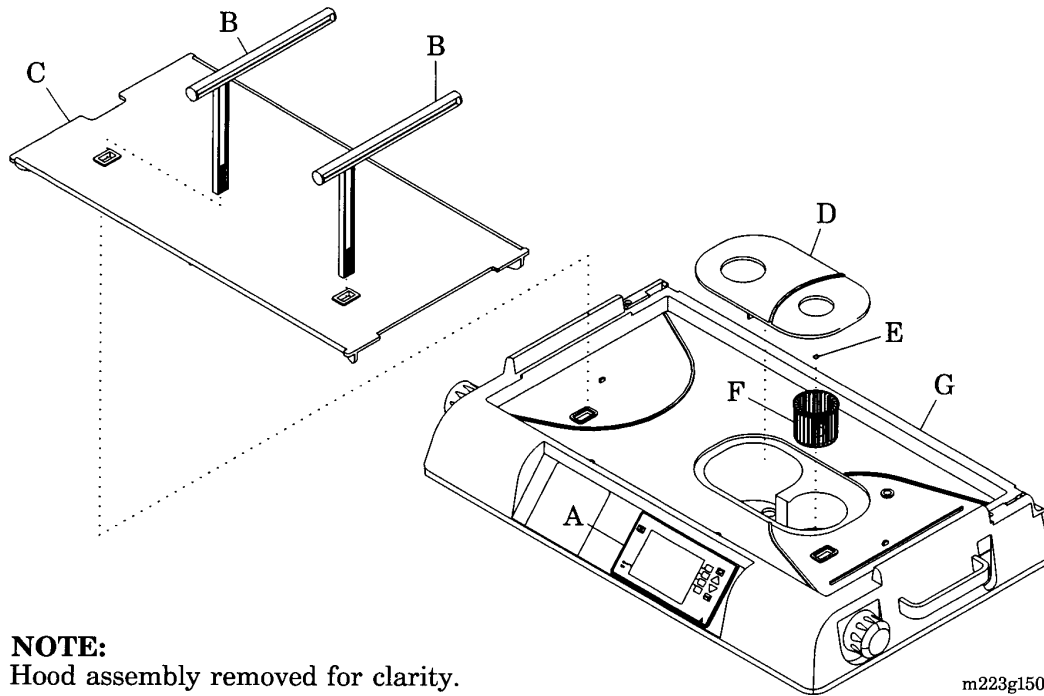


SHOCK HAZARD:

Unplug the power cord from the controller assembly. Failure to do so could result in personal injury or equipment damage.

1. Unplug the power cord from the controller assembly (A) (see figure 4-8 on page 4-19).

Figure 4-8. Impeller Assembly



NOTE:

Hood assembly removed for clarity.

2. Lift the hood assembly, and carefully tilt it back to its open position.
3. Remove the mattress, the mattress tray, and the x-ray tray from the unit (refer to procedure 4.7 on page 4-17).
4. Pull the two mattress tilt bars (B) up through the main deck (C), and remove them from the unit.

5. Remove the main deck (C) from the unit.
6. Remove the heater/impeller cover (D) from the unit.
7. Using pliers, remove the wire hose clamp (E) that secures the impeller assembly (F) to the shell assembly (G).
8. Remove the impeller assembly (F) from the shell assembly (G).

Replacement

1. Perform the removal procedure in reverse order.
2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

4.9 Motor Assembly

Tools required: Phillips head screwdriver
Pliers
Flat, padded surface

Removal



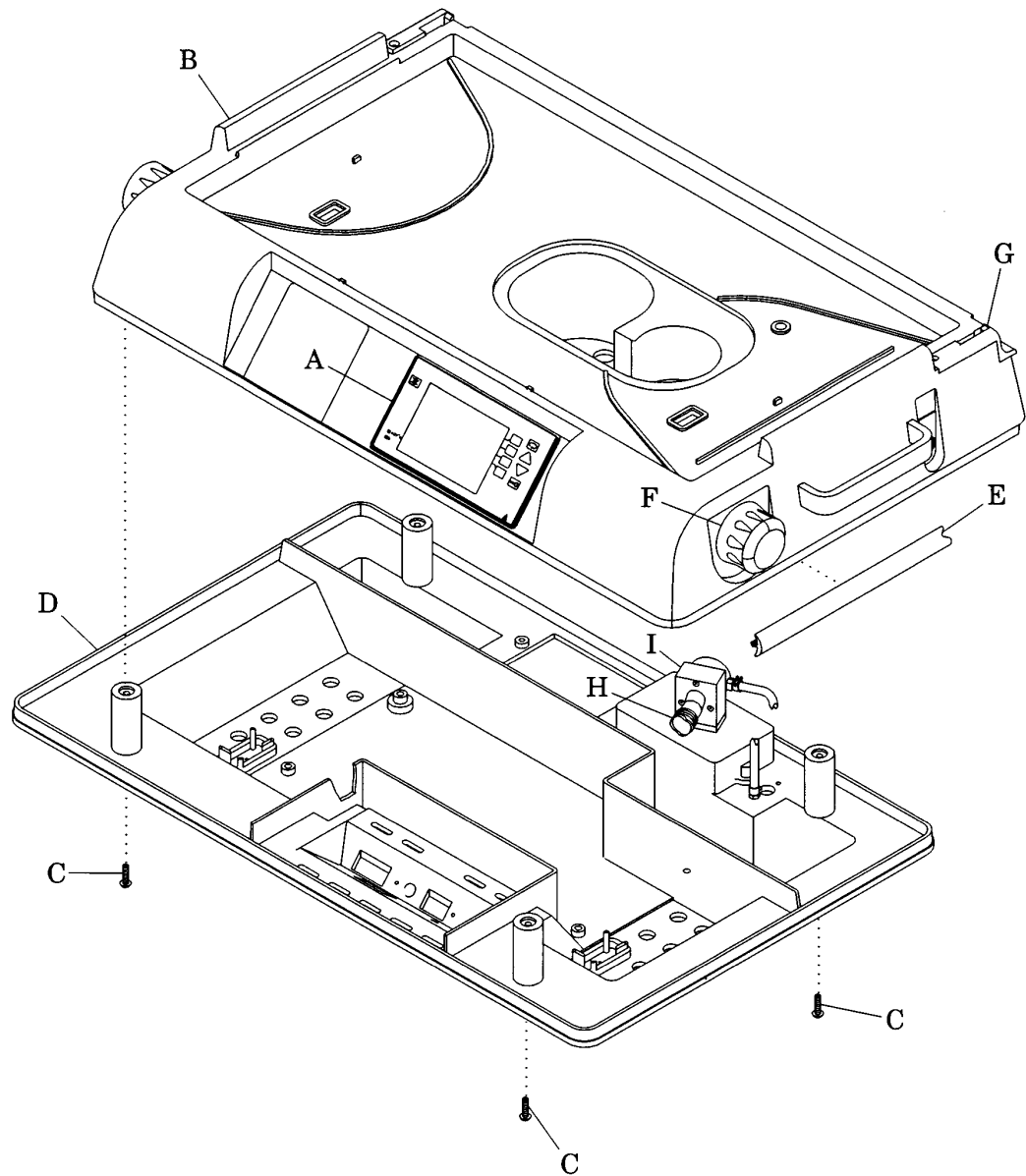
SHOCK HAZARD:

Unplug the power cord from the controller assembly. Failure to do so could result in personal injury or equipment damage.

1. Unplug the power cord from the controller assembly (A) (see figure 4-9 on page 4-22).
2. Remove the controller assembly from the shell assembly (refer to procedure 4.4 on page 4-10).
3. Remove the hood assembly from the unit (refer to procedure 4.5 on page 4-12).
4. Remove the mattress, the mattress tray, and the x-ray tray from the unit (refer to procedure 4.7 on page 4-17).
5. Remove the impeller assembly from the unit (refer to procedure 4.8 on page 4-19).
6. If the unit is equipped with a humidity system, remove it (refer to procedure 7.3 on page 7-14).
7. If the unit is equipped with an oxygen system, remove it (refer to procedure 7.2 on page 7-8).
8. Remove the four Nylok®¹ screws (C) that secure the shell bottom (D) to the shell assembly (B). **Discard** the four Nylok® screws (C).
9. Remove the extrusion bumper (E) from between the shell assembly (B) and the shell bottom (D).

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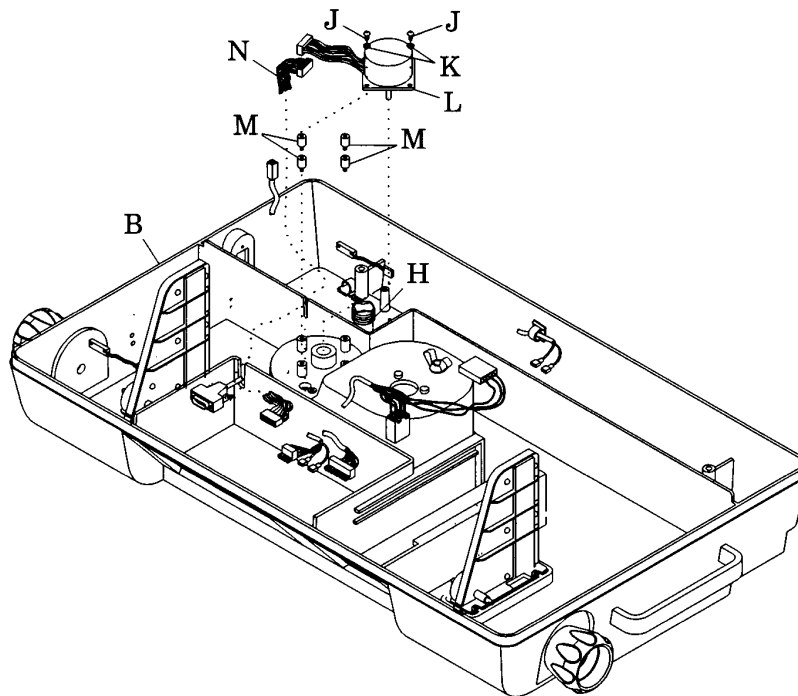
Figure 4-9. Shell Assembly



m223g151

10. Stand at the same end of the shell assembly (B) as the controller assembly (A), and perform the following:
 - a. Using the mattress tilt knob (F) and the rear hood hinge (G), lift the shell assembly (B) enough to access the corrugated hose (H) at the check valve assembly (I).
 - b. Using pliers, disconnect and remove the corrugated hose (H) from the shell assembly (B) and the shell bottom (D).
 - c. Carefully remove the shell assembly (B) from the shell bottom (D), and place it upside down on a flat, padded surface.
11. Remove the four screws (J) and the four lockwashers (K) that secure the motor assembly (L) to the shell assembly (B) (see figure 4-10 on page 4-23). **Retain** the four screws (J) and the four lockwashers (K).

Figure 4-10. Motor Assembly



m223g035

12. Remove the motor assembly (L) and the four vibration isolators (M) from the shell assembly (B). **Retain** the four vibration isolators (M).
13. Disconnect the motor assembly (L) from the incubator motor-to-controller cable assembly (N).

Replacement

1. Install the four screws (J) and the four lockwashers (K) to secure the motor assembly (L) and the four vibration isolators (M) to the shell assembly (B).
2. Connect the motor assembly (L) to the incubator motor-to-controller cable assembly (N), and route the incubator motor-to-controller cable assembly (N) through the slots in the shell assembly (B).
3. Connect the corrugated hose (H) to the shell assembly (B).



CAUTION:

Use caution when lowering the shell assembly in place on the shell bottom. Ensure that no cables are pinched and that the extrusion bumper fits properly. Failure to do so could result in equipment damage.

4. Stand at the same end of the shell assembly (B) as the controller assembly (A), and perform the following (see figure 4-9 on page 4-22):
 - a. Connect the corrugated hose (H) to the check valve assembly (I).
 - b. Carefully lower the shell assembly (B) in place on the shell bottom (D).
 - c. Ensure that no cables are pinched between the shell assembly (B) and the shell bottom (D).
 - d. Ensure that the extrusion bumper (E) fits properly between the shell assembly (B) and the shell bottom (D).



CAUTION:

Always replace Nylok®¹ screws; do **not** reuse them. Equipment damage could occur.

5. Install four new Nylok® screws (C) to secure the shell bottom (D) to the shell assembly (B).
6. If the unit is equipped with an oxygen system, install it (refer to procedure 7.2 on page 7-8).
7. If the unit is equipped with a humidity system, install it (refer to procedure 7.3 on page 7-14).

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8. Install the impeller assembly on the unit (refer to procedure 4.8 on page 4-19).
9. Install the mattress, the mattress tray, and the x-ray tray on the unit (refer to procedure 4.7 on page 4-17).
10. Install the hood assembly on the unit (refer to procedure 4.5 on page 4-12).
11. Install the controller assembly in the shell assembly (refer to procedure 4.4 on page 4-10).
12. Plug the power cord into the controller assembly (A).
13. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

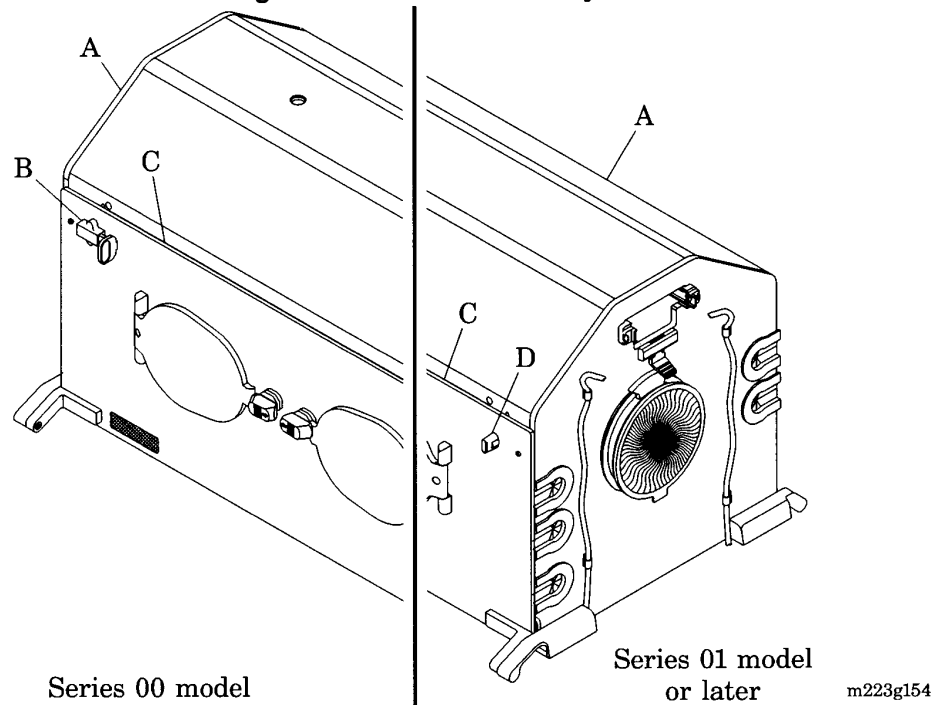
4.10 Access Panel

Tools required: 1/8" hex head wrench
Phillips head screwdriver
Access panel gauge (P/N 83 900 14)

Removal

1. On a unit with a Series 00 hood assembly (A), slide the blue slide access panel latches (B), and open the access panel (C) (see figure 4-11 on page 4-26).
or
On a unit with a hood assembly (A) later than Series 00, rotate the access panel pawl latch knobs (D), and open the access panel (C).

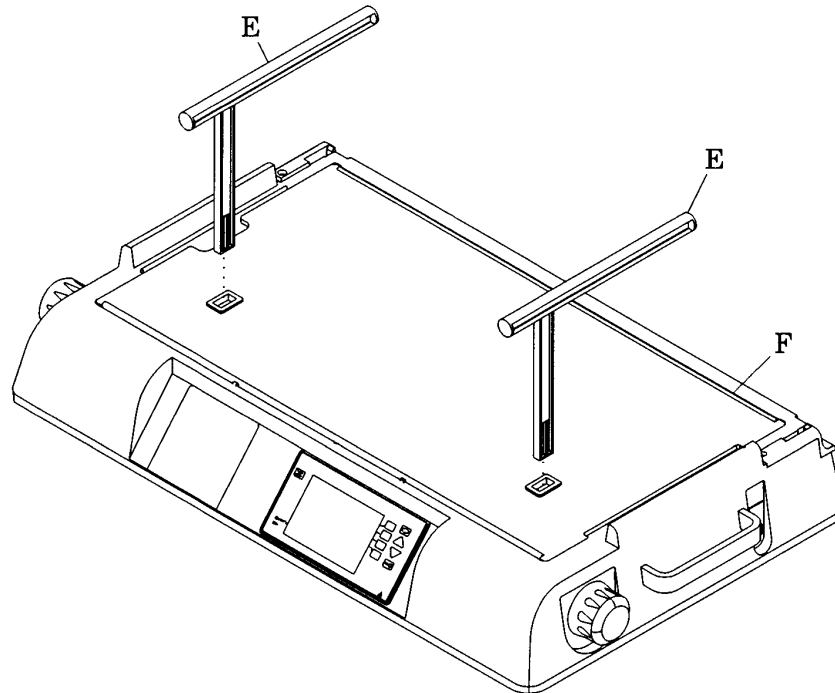
Figure 4-11. Hood Assembly



2. Pivot the access panel (C) to the full-open position so it hangs straight down.
3. Remove the mattress, the mattress tray, and the x-ray tray from the unit (refer to procedure 4.7 on page 4-17).

4. Pull the two mattress tilt bars (E) up through the main deck (F), and remove them from the unit (see figure 4-12 on page 4-27).

Figure 4-12. Mattress Platform Assembly

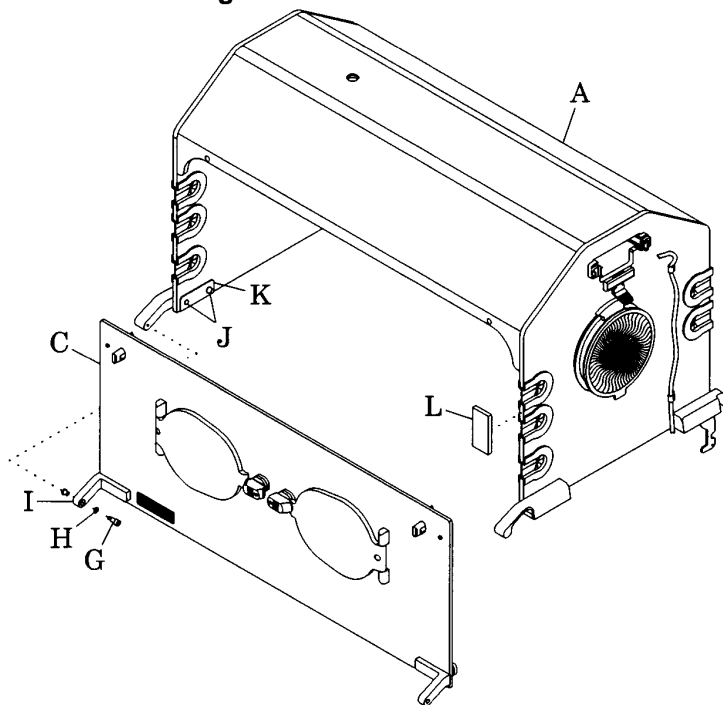


m223g153

5. Close and latch the access panel (C) (see figure 4-11 on page 4-26).

6. Using a 1/8" hex head wrench, remove the two shoulder screws (G) and the two flat washers (H) that secure the access panel hinges (I) to the hood assembly (A) (see figure 4-13 on page 4-28). **Retain** the two shoulder screws (G) and the two flat washers (H).

Figure 4-13. Access Panel



m223g036

7. Remove the access panel (C) from the hood assembly (A).

Replacement

1. Install the two shoulder screws (G) and the two flat washers (H) to secure the access panel hinges (I) to the hood assembly (A).
2. Adjust the blue slide access panel latches or the access panel pawl latch knobs (see "Adjustment" on page 4-29).
3. Slide the two mattress tilt bars (E) into the main deck (F) (see figure 4-12 on page 4-27).
4. Install the mattress, the mattress tray, and the x-ray tray on the unit.
5. Close and latch the access panel (C).

6. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

Adjustment

1. Loosen, but do not remove, the four screws (J) that secure the two hinge plates (K) to the hood assembly (A) (see figure 4-13 on page 4-28).
2. Perform the following at each side of the hood assembly (A):
 - a. Close the access panel (C) on the access panel gauge (L). Ensure that the access panel (C) securely latches.
 - b. Push the end of the access panel (C) firmly against the access panel gauge (N).
 - c. Tighten the rear screw (J) of the hinge plate (K).
3. Hold the access panel gauge (L), and open the access panel (C).
4. At each hinge plate (K), simultaneously press down on the tab and tighten the front screw (J).
5. On a unit with a Series 00 hood assembly (A), slide the blue slide access panel latches (B), and open the access panel (C) (see figure 4-11 on page 4-26).
or
On a unit with a hood assembly (A) later than Series 00, rotate the access panel pawl latch knobs (D), and open the access panel (C).
6. Pivot the access panel (C) to the full-open position so it hangs straight down.
7. Close and latch the access panel (C). Ensure that the access panel (C) latches properly. If the access panel (C) does **not** latch properly, readjust the blue slide access panel latches (B) or the access panel pawl latch knobs (D).
8. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

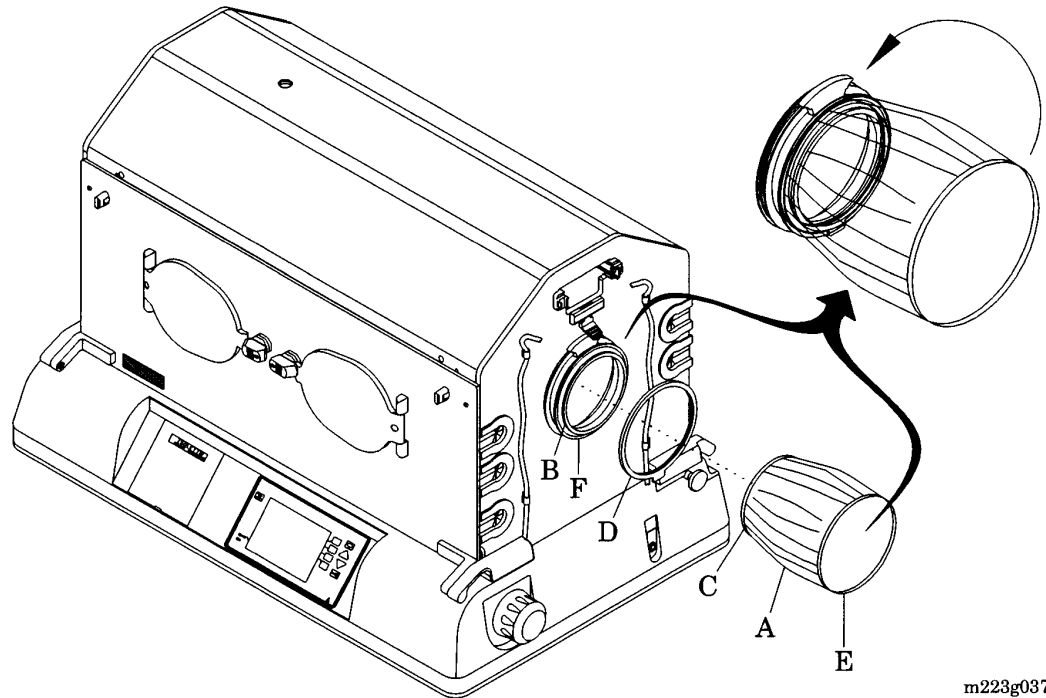
4.11 Iris Entry Port Sleeve

Tools required: None

Removal

Pull the iris entry port sleeve (A) off the port housing (B) (see figure 4-14 on page 4-30).

Figure 4-14. Iris Entry Port Sleeve



Replacement

1. Install the smaller diameter elastic band (C) of a new iris entry port sleeve (A) over the inner ring (D) of the port housing (B).
2. Fold the iris entry port sleeve (A) back upon itself, and slip the larger elastic band (E) over the outer ring (F) of the port housing (B).
3. Rotate the outer ring (F) to close.

4. Rotate the outer ring (F) in the other direction:
 - If the iris entry port sleeve (A) is properly installed, it opens with the rotation of the outer ring (F).
 - If the iris entry port sleeve (A) does **not** open with the rotation of the outer ring (F), remove and re-install it (see “Removal” on page 4-30).
5. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

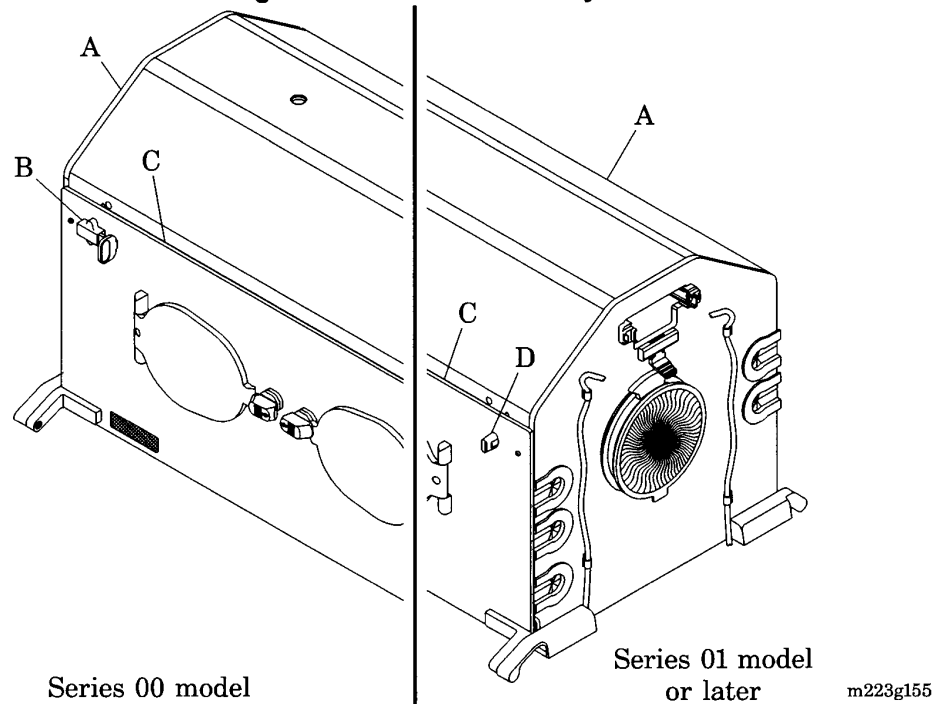
4.12 Access Door Latch

Tools required: Phillips head screwdriver

Removal

1. On a unit with a Series 00 hood assembly (A), slide the blue slide access panel latches (B), and open the access panel (C) (see figure 4-15 on page 4-32).
or
On a unit with a hood assembly (A) later than Series 00, rotate the access panel pawl latch knobs (D), and open the access panel (C).

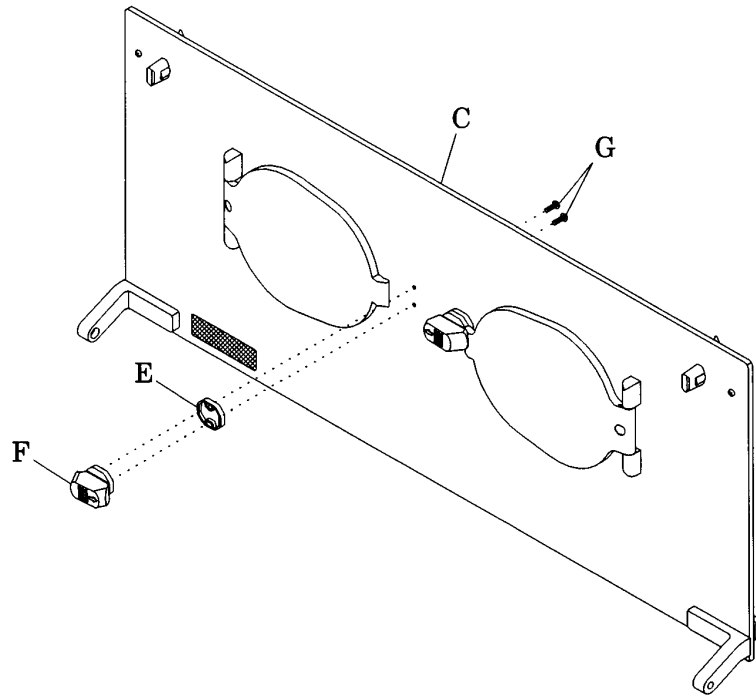
Figure 4-15. Hood Assembly



2. Pivot the access panel (C) to the full-open position so it hangs straight down.

3. Remove the two Nylok®¹ screws (G) that secure the access door latch mount (E) and access door latch (F) to the access panel (C) (see figure 4-16 on page 4-33). **Discard** the two Nylok® screws (G).

Figure 4-16. Access Door Latch



m223g119

4. Remove the access door latch mount (E) and access door latch (F) from the access panel (C).

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Replacement



CAUTION:

Always replace Nylok®¹ screws; do **not** reuse them. Equipment damage could occur.

1. Install two new Nylok® screws (G) to secure the access door latch mount (E) and the access door latch (F) to the access panel (C).
2. Close and latch the access panel (C).
3. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

1. Nylok® is a registered trademark of Nylok Fastener Corporation.

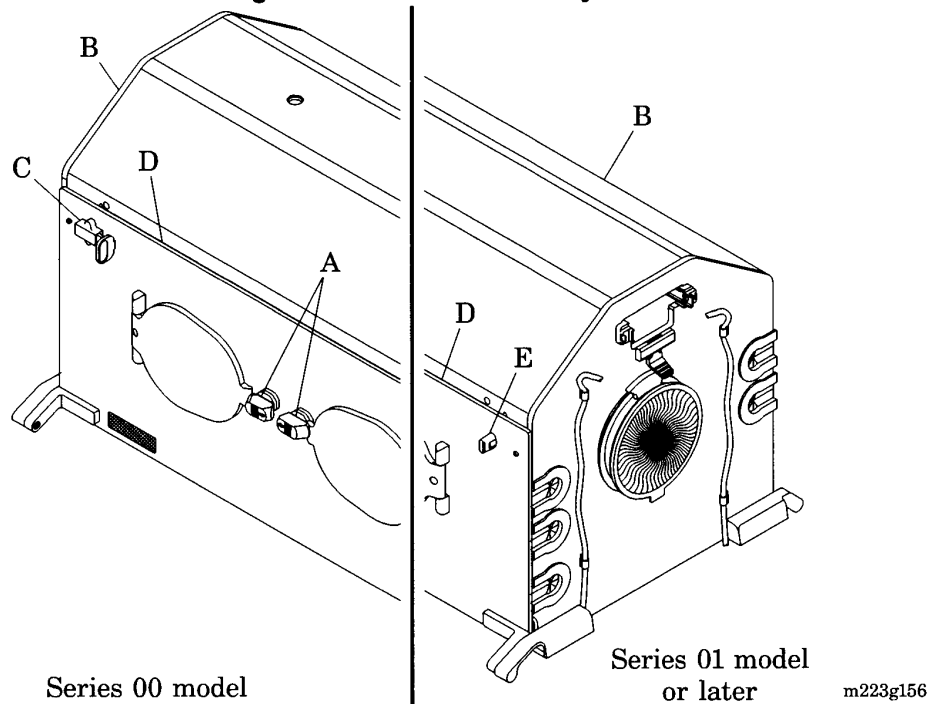
4.13 Access Door and Access Door Pivot Hinges

Tools required: Phillips head screwdriver

Removal

1. Release the access door latch (A) (see figure 4-17 on page 4-35).

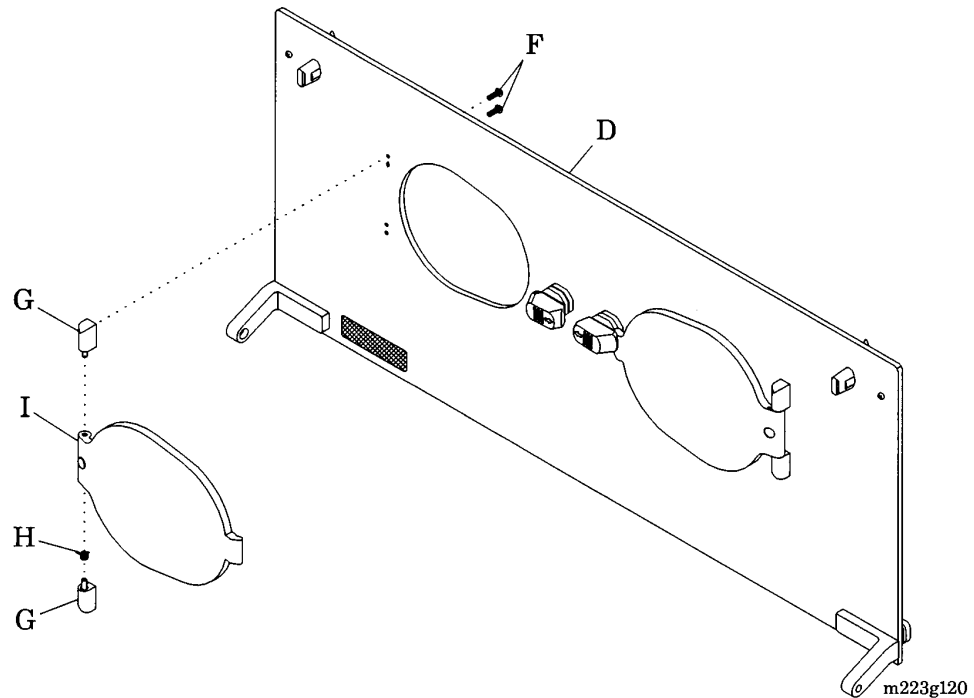
Figure 4-17. Hood Assembly



2. On a unit with a Series 00 hood assembly (B), slide the blue slide access panel latches (C), and open the access panel (D).
or
On a unit with a hood assembly (B) later than Series 00, rotate the access panel pawl latch knobs (E), and open the access panel (D).
3. Pivot the access panel (D) to the full-open position so it hangs straight down.

4. Remove the four Nylok® screws (F) that secure the two access door pivot hinges (G) to the access panel (D) (see figure 4-18 on page 4-36). **Discard** the four Nylok® screws (F).

Figure 4-18. Access Door Pivot Hinge



5. Remove the two access door pivot hinges (G), the torsion spring (H), and the access door (I) from the access panel (D).

Replacement

1. Perform one of the following:
 - On a left-hand access door (I), install the torsion spring (H) on the **lower** access door pivot hinge (G).
 - On a right-hand access door (I), install the torsion spring (H) on the **upper** access door pivot hinge (G).
2. Install the two access door pivot hinges (G) on the access door (I).

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CAUTION:

Always replace Nylok® screws; do **not** reuse them. Equipment damage could occur.

3. Install the four new Nylok® screws (F) to secure the access door pivot hinges (G) to the access panel (D).
4. Close and latch the access panel (D).
5. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

1. Nylok® is a registered trademark of Nylok Fastener Corporation.

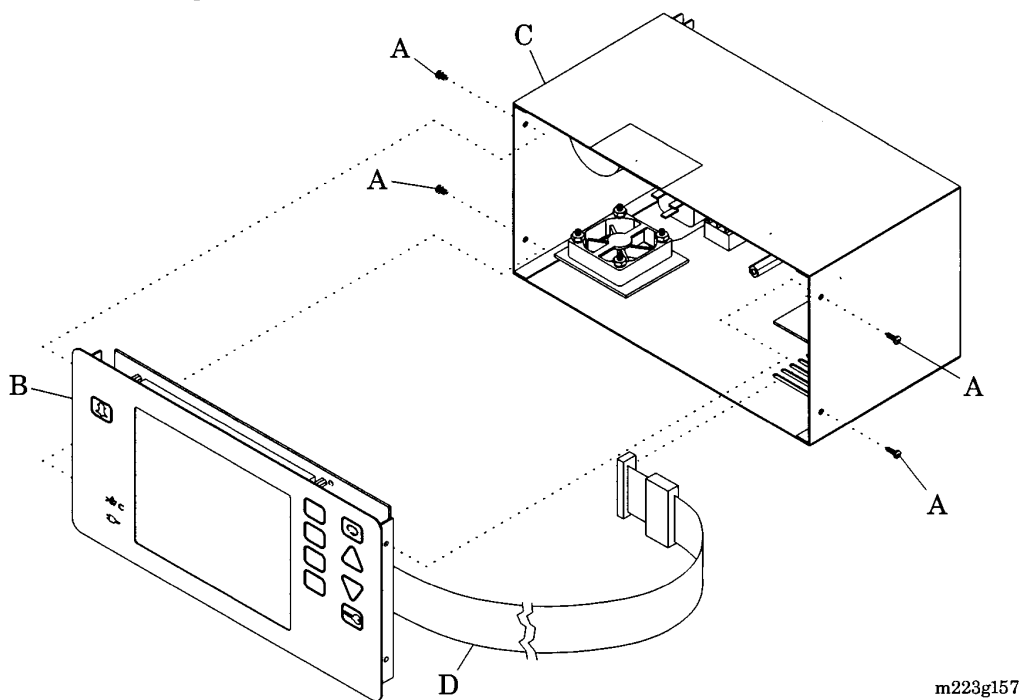
4.14 Electroluminescent (EL) Display Front Panel

Tools required: Phillips head screwdriver

Removal

1. Remove the controller assembly from the unit (refer to procedure 4.4 on page 4-10).
2. Remove the four screws (A) that secure the electroluminescent (EL) display front panel assembly (B) to the controller assembly (C) (see figure 4-19 on page 4-38).

Figure 4-19. Electroluminescent Display Front Panel



3. Slide the EL display front panel assembly (B) out of the controller assembly (C), and disconnect it from the central processing unit (CPU) interface ribbon cable assembly (D).
4. Remove the EL display front panel assembly (B) from the controller assembly (C).

Replacement

1. Perform the removal procedure in reverse order.
2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

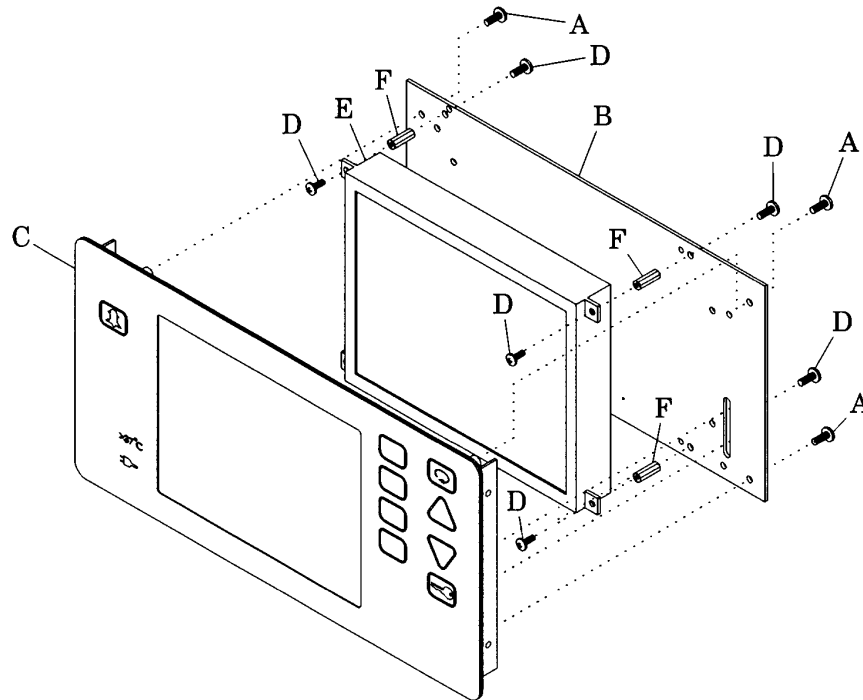
4.15 Electroluminescent (EL) Central Processing Unit (CPU) P.C. Board, EL Display Faceplate, and EL Display

Tools required: Phillips head screwdriver

Removal

1. Remove the controller assembly from the unit (refer to procedure 4.4 on page 4-10).
2. Remove the electroluminescent (EL) display front panel assembly from the controller assembly (refer to procedure 4.14 on page 4-38).
3. Remove the four screws (A) that secure the EL central processing unit (CPU) P.C. board (B) to the EL display faceplate (C) (see figure 4-20 on page 4-40).

Figure 4-20. EL CPU P.C. Board and EL Display



m223g158

4. Remove the EL CPU P.C. board (B) from the EL display faceplate (C) (see "Component Handling" on page 6-8).
5. Remove the eight screws (D) that secure the EL display (E) to the EL CPU P.C. board (B).

6. Remove the EL display (E) and the four aluminum standoffs (F) from the EL CPU P.C. board (B) (see “Component Handling” on page 6-8).

Replacement

1. Perform the removal procedure in reverse order.
2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

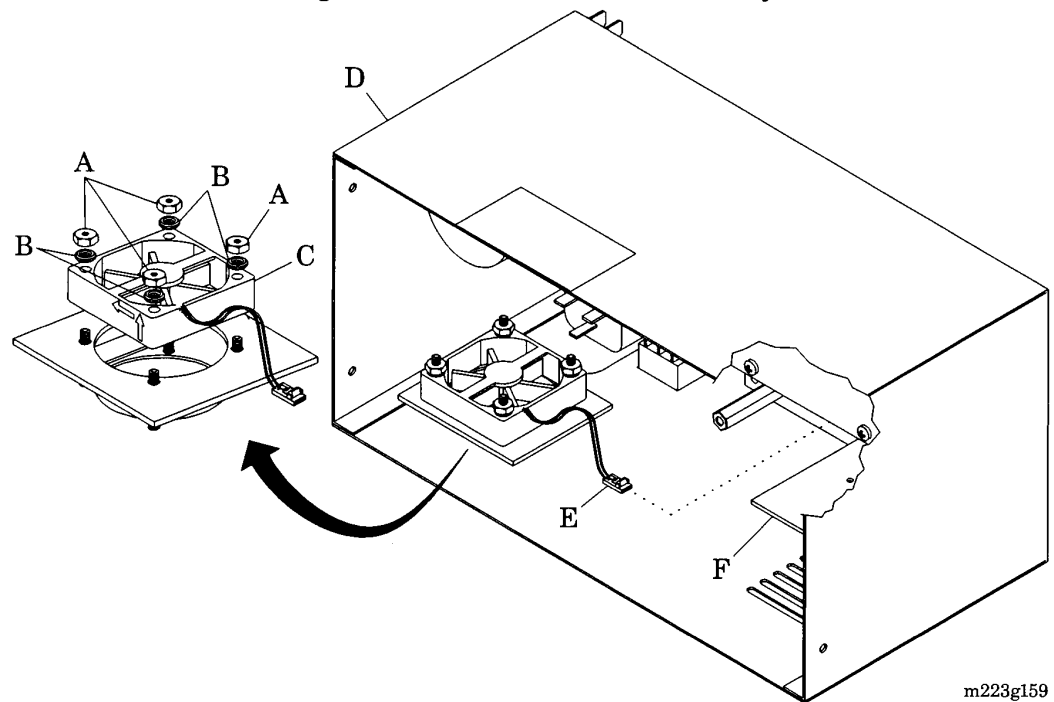
4.16 Controller Fan Assembly

Tools required: 7/32" socket wrench

Removal

1. Remove the controller assembly from the unit (refer to procedure 4.4 on page 4-10).
2. Remove the EL display front panel assembly from the controller assembly (refer to procedure 4.14 on page 4-38).
3. Using a 7/32" socket wrench, remove the four hex nuts (A) and the four o-rings (B) that secure the fan assembly (C) to the controller assembly (D) (see figure 4-21 on page 4-42).

Figure 4-21. Controller Fan Assembly



4. Disconnect the fan assembly cable (E) from the interface/power supply module (F).
5. Remove the fan assembly (C) from the controller assembly (D).

Replacement

1. Perform the removal procedure in reverse order.
2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

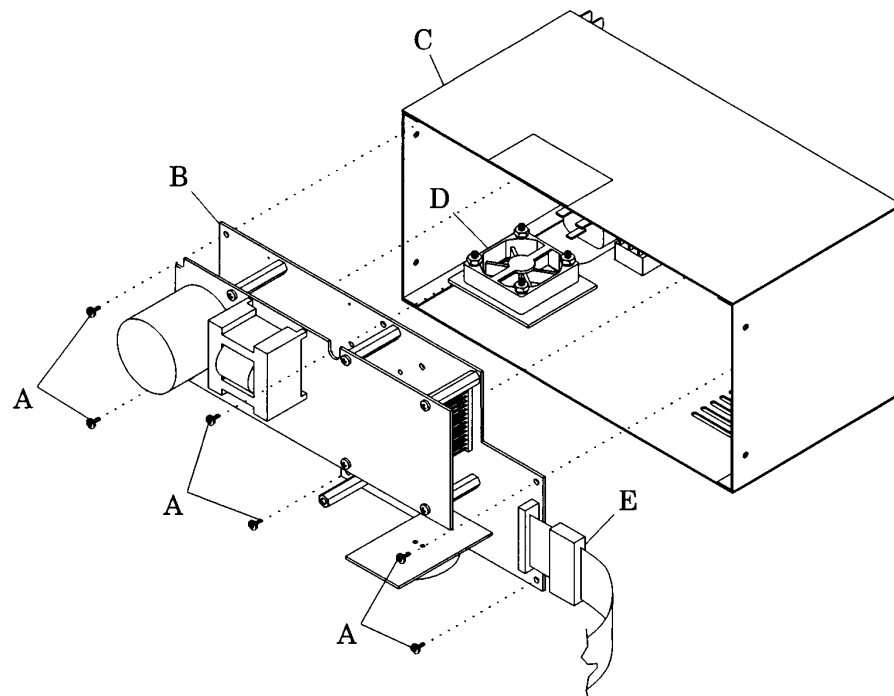
4.17 Interface/Power Supply Module

Tools required: Phillips head screwdriver

Removal

1. Remove the controller assembly from the unit (refer to procedure 4.4 on page 4-10).
2. Remove the EL display front panel assembly from the controller assembly (refer to procedure 4.14 on page 4-38).
3. Remove the six screws (A) that secure the interface/power supply module (B) to the controller assembly (C) (see figure 4-22 on page 4-44).

Figure 4-22. Interface/Power Supply Module



m223g160

4. Disconnect the fan assembly (D) from the interface/power supply module (B).
5. Remove the interface/power supply module (B) from the controller assembly (C).
6. Disconnect the central processing unit (CPU) interface ribbon cable assembly (E) from the interface/power supply module (B).

Replacement

1. Perform the removal procedure in reverse order.
2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

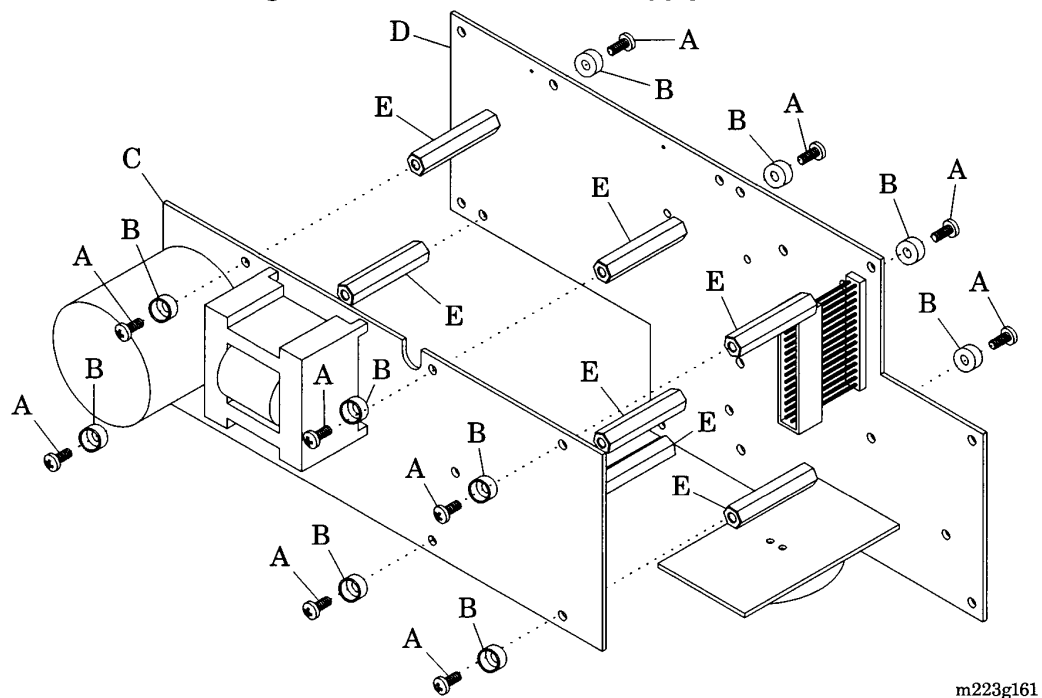
4.18 Power Supply P.C. Board Assembly and Interface P.C. Board Assembly

Tools required: Phillips head screwdriver

Removal

1. Remove the controller assembly from the unit (refer to procedure 4.4 on page 4-10).
2. Remove the EL display front panel assembly from the controller assembly (refer to procedure 4.14 on page 4-38).
3. Remove the interface/power supply module from the controller assembly (refer to procedure 4.17 on page 4-44).
4. Remove the 13 screws (A) and the 13 cup washers (B) that secure the power supply P.C. board assembly (C) to the interface P.C. board assembly (D) (see figure 4-23 on page 4-46).

Figure 4-23. Interface/Power Supply Module



m223g161

5. Remove the power supply P.C. board (C) and the seven nylon standoffs (E) from the interface P.C. board assembly (D) (see “Component Handling” on page 6-8).

Replacement

1. Perform the removal procedure in reverse order.
2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

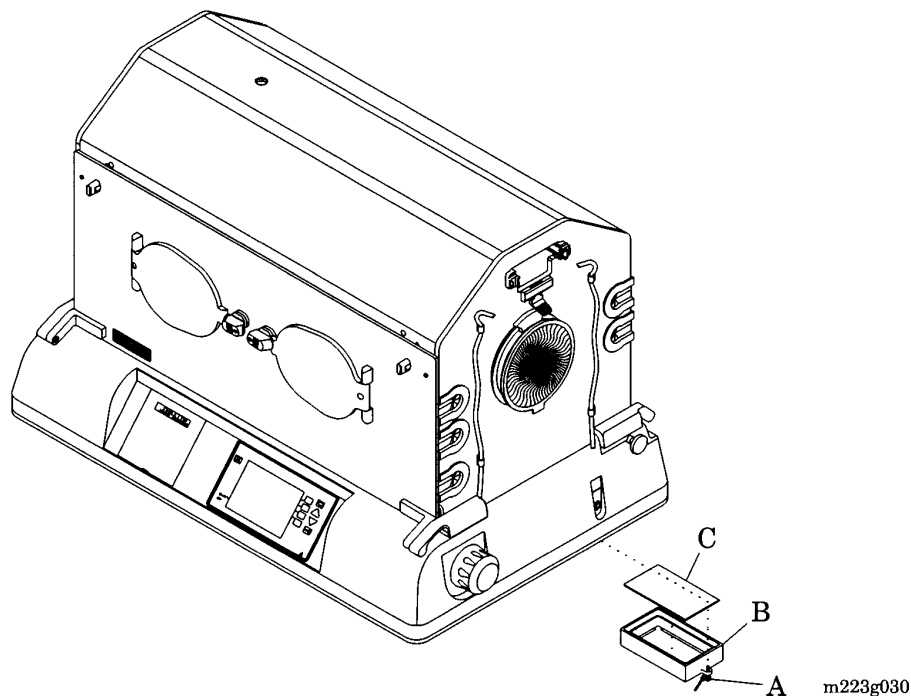
4.19 Air Intake Microfilter

Tools required: None

Removal

1. Loosen the two thumbscrews (A) that secure the air intake microfilter cover (B) to the unit (see figure 4-24 on page 4-48).

Figure 4-24. Air Intake Microfilter



2. Remove the air intake microfilter cover (B) from the unit.
3. Remove the air intake microfilter (C) from the air intake microfilter cover (B).

Replacement

1. Perform the removal procedure in reverse order.
2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

4.20 Heater Assembly

Tools required: Phillips head screwdriver

Removal

**SHOCK HAZARD:**

Unplug the unit from its power source. Failure to do so could result in personal injury or equipment damage.

1. Unplug the unit from its power source.
2. Lift the hood assembly, and carefully tilt it back to its open position.
3. Remove the mattress, the mattress tray, and the x-ray tray from the unit (refer to procedure 4.7 on page 4-17).
4. Pull the two mattress tilt bars (A) up through the main deck (B), and remove them from the unit (see figure 4-25 on page 4-50).
5. Remove the main deck (B) from the unit.
6. Remove the heater/impeller cover (C) from the unit.

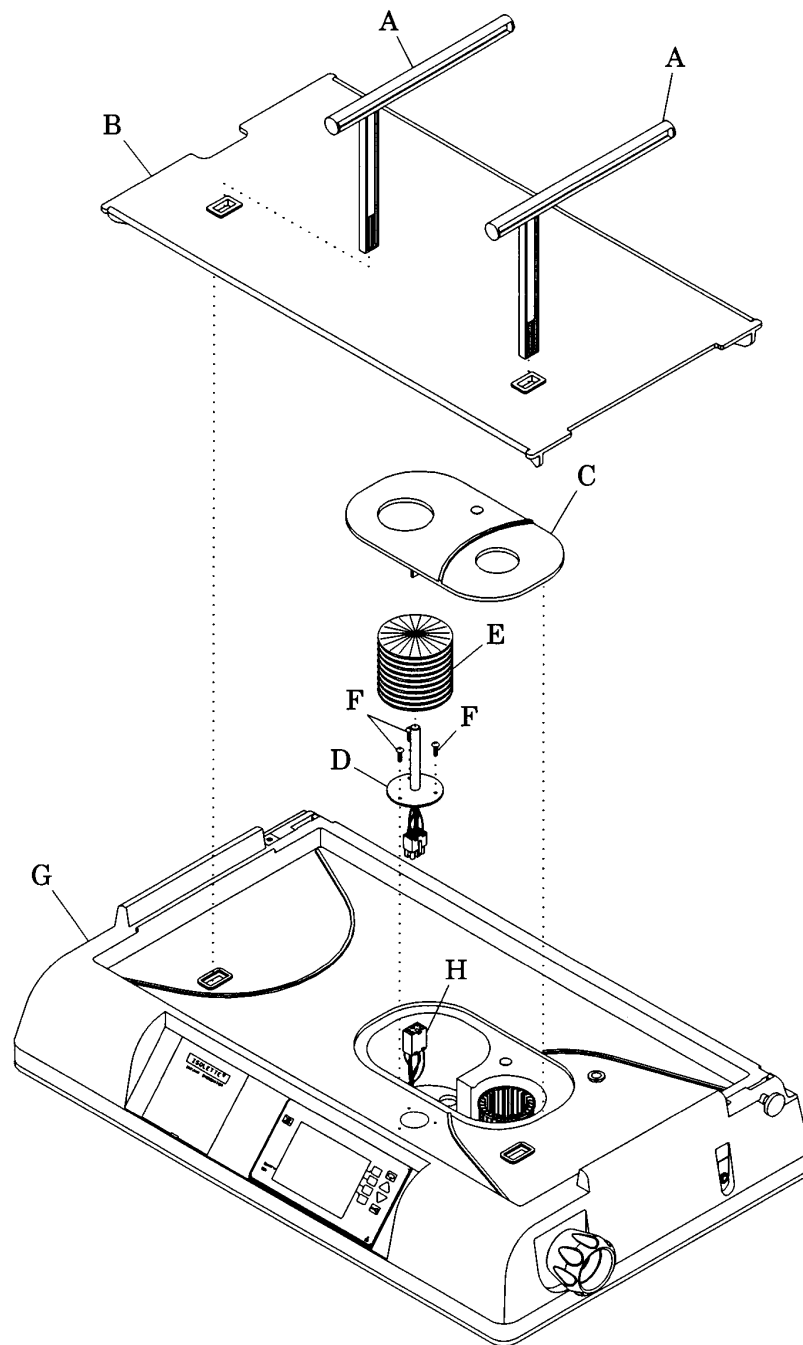
**WARNING:**

Allow 45 minutes for the heater assembly to cool. Failure to do so could result in personal injury.

7. Allow 45 minutes for the heater assembly (D) to cool.
8. Unscrew the heater radiator (E) from the heater assembly (D).
9. Remove the three Nylok®¹ screws (F) that secure the heater assembly (D) to the shell assembly (G). **Discard** the three Nylok® screws (F).
10. Pull up on the heater assembly (D), and disconnect it from the AC wiring assembly (H).
11. Remove the heater assembly (D) from the shell assembly (G).

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Figure 4-25. Heater Assembly



m223g162

Replacement

1. Connect the heater assembly (D) to the AC wiring assembly (H), and route the cables down into the shell assembly (G).



CAUTION:

Always replace Nylok® screws; do **not** reuse them. Equipment damage could occur.

2. Install the three new Nylok® screws (F) to secure the heater assembly (D) to the shell assembly (G).
3. Screw the heater radiator (E) onto the heater assembly (D).
4. Install the heater/impeller cover (C) on the shell assembly (G).
5. Install the main deck (B) on the shell assembly (G).
6. Slide the two mattress tilt bars (A) through their openings in the main deck (B).
7. Install the mattress, the mattress tray, and the x-ray tray on the unit (refer to procedure 4.7 on page 4-17).
8. Carefully lower the hood assembly to its closed position.
9. To ensure proper operation of the Isolette® Infant Incubator, perform the "Function Checks" on page 2-6.

1. Nylok® is a registered trademark of Nylok Fastener Corporation.

4.21 Impeller Movement Detection Sensor

Tools required: Phillips head screwdriver
 Small screwdriver
 Long-nose pliers

Removal



SHOCK HAZARD:

Unplug the unit from its power source. Failure to do so could result in personal injury or equipment damage.

1. Unplug the unit from its power source.
2. Lift the hood assembly, and carefully tilt it back to its open position.
3. Remove the mattress, the mattress tray, and the x-ray tray from the unit (refer to procedure 4.7 on page 4-17).
4. Pull the two mattress tilt bars (A) up through the main deck (B), and remove them from the unit (see figure 4-26 on page 4-53).
5. Remove the main deck (B) from the unit.
6. Remove the heater/impeller cover (C) from the unit.



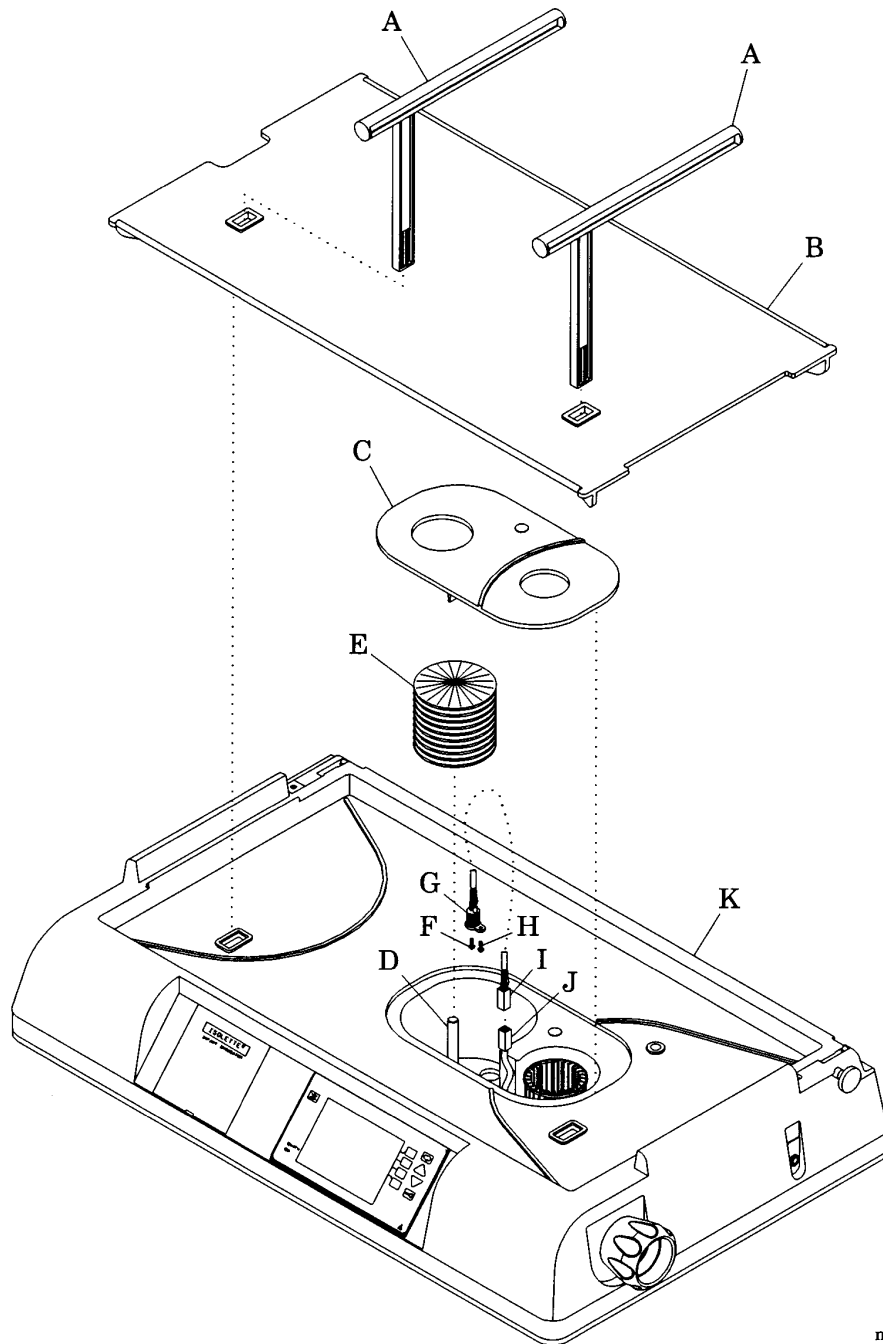
WARNING:

Allow 45 minutes for the heater assembly to cool. Failure to do so could result in personal injury.

7. Allow 45 minutes for the heater assembly (D) to cool.
8. Unscrew the heater radiator (E) from the heater assembly (D).
9. Remove the impeller assembly from the unit (refer to procedure 4.8 on page 4-19).
10. Using a small screwdriver, carefully **loosen** the screw (F) in the middle of the impeller movement detection sensor (G). Do **not** remove the screw (F).
11. Remove the Nylok®¹ screw (H) that secures the impeller movement detection sensor (G) to the unit.

1. Nylok® is a registered trademark of Nylok Fastener Corporation.

Figure 4-26. Shell Assembly



m223g165

12. Remove the impeller movement detection sensor (G) from the unit enough to access its connector (I).
13. Disconnect the connector (I) from the cable assembly (J). Do **not** allow the cable assembly (J) to slide back into the shell assembly (K).
14. Remove the impeller movement detection sensor (G) from the unit.

Replacement

1. Connect the impeller movement detection sensor (G) to the cable assembly (J).
2. Install the impeller movement detection sensor (G) so its flat edge is parallel with the front of the unit.



CAUTION:

Always replace Nylok®¹ screws; do **not** reuse them. Equipment damage could occur.

3. Install a new Nylok® screw (H) to secure the impeller movement detection sensor (G) to the unit.
4. Using a small screwdriver, tighten the screw (F).
5. Install the impeller assembly (refer to procedure 4.8 on page 4-19).
6. Screw the heater radiator (E) onto the heater assembly (D).
7. Install the heater/impeller cover (C) on the unit.
8. Install the main deck (B) on the unit.
9. Slide the two mattress tilt bars (A) through their openings in the main deck (B).
10. Install the mattress, the mattress tray, and the x-ray tray on the unit (refer to procedure 4.7 on page 4-17).
11. Carefully lower the hood assembly to its closed position.
12. To ensure proper operation of the Isolette® Infant Incubator, perform the "Function Checks" on page 2-6.

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4.22 AC Wiring Harness Assembly

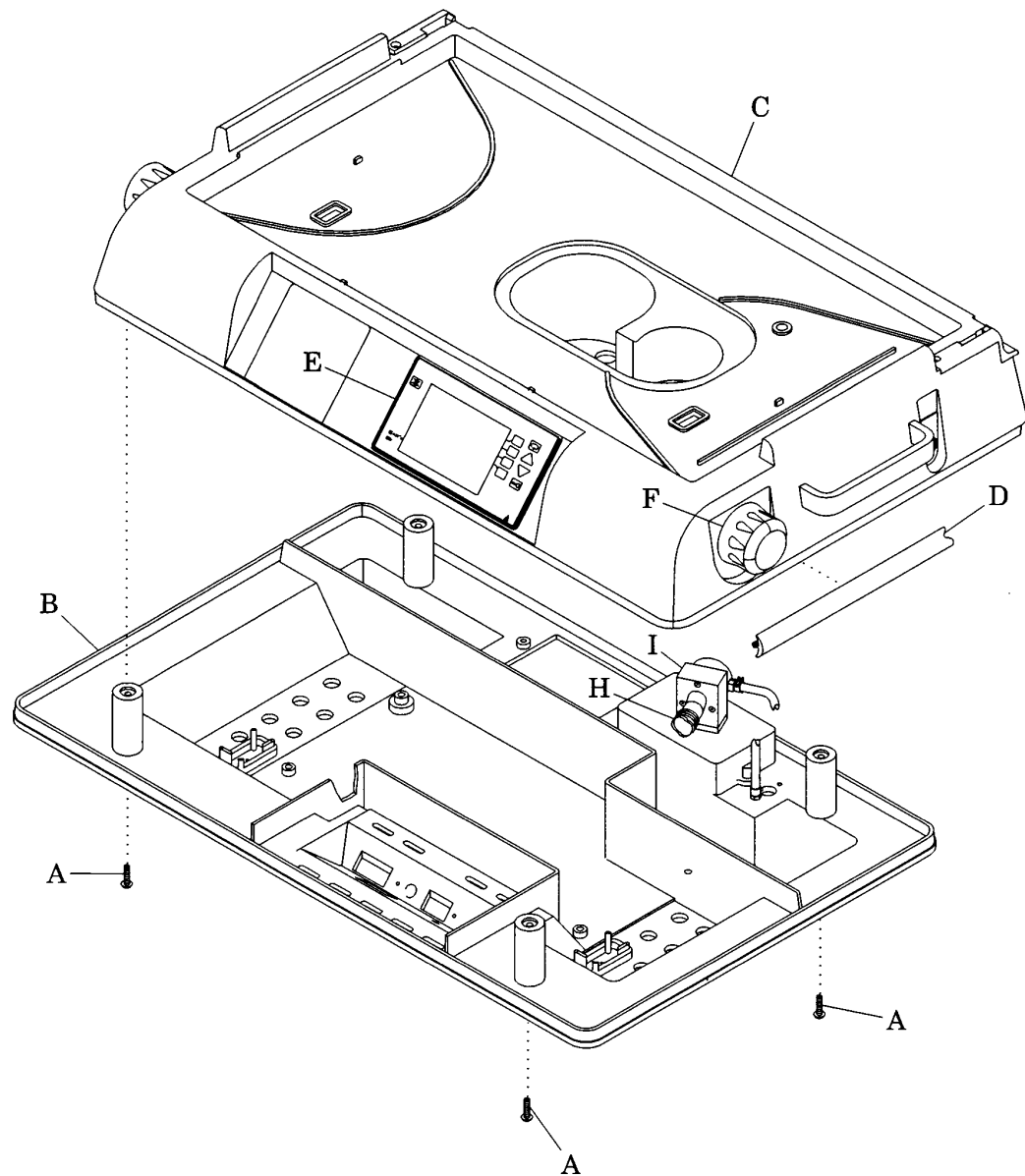
Tools required: Pliers
Flat padded surface

Removal

1. Remove the controller assembly from the shell assembly (refer to procedure 4.4 on page 4-10).
2. Remove the hood assembly from the unit (refer to procedure 4.5 on page 4-12).
3. Remove the mattress, the mattress tray, and the x-ray tray from the unit (refer to procedure 4.7 on page 4-17).
4. Remove the impeller assembly from the unit (refer to procedure 4.8 on page 4-19).
5. Remove the heater assembly from the unit (refer to procedure 4.20 on page 4-49).
6. If the unit is equipped with a humidity system, remove it (refer to procedure 7.3 on page 7-14).
7. If the unit is equipped with an oxygen system, remove it (refer to procedure 7.2 on page 7-8).
8. Remove the four Nylok®¹ screws (A) that secure the shell bottom (B) to the shell assembly (C) (see figure 4-27 on page 4-56). **Discard** the four Nylok® screws (A).
9. Remove the extrusion bumper (D) from between the shell assembly (C) and the shell bottom (B).
10. Stand at the same end of the shell assembly (C) as the controller assembly (E), and perform the following:
 - a. Using the mattress tilt knob (F) and the rear hood hinge (G), lift the shell assembly (C) enough to access the corrugated hose (H) at the check valve assembly (I).
 - b. Using pliers, disconnect and remove the corrugated hose (H) from the shell assembly (C) and the shell bottom (B).

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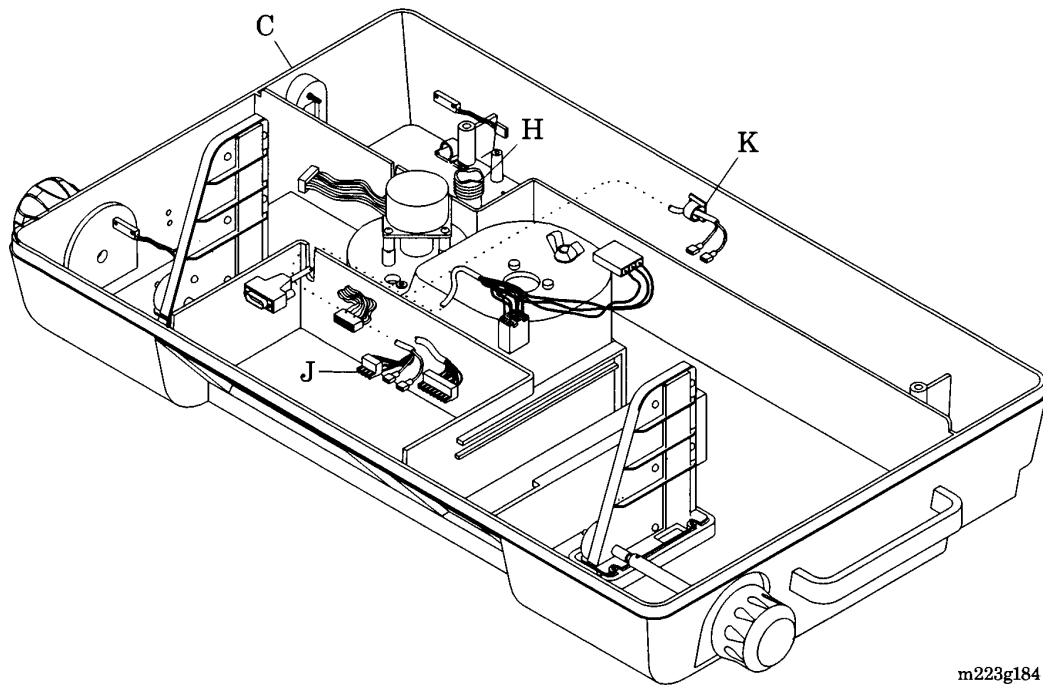
Figure 4-27. Shell Assembly



m223g183

- c. Carefully remove the shell assembly (C) from the shell bottom (B), and place it upside down on a flat, padded surface.
11. Remove the AC wiring harness assembly (J) from the cord retaining clips (K) inside the shell assembly (C) (see figure 4-28 on page 4-57).

Figure 4-28. AC Wiring Harness Assembly



12. Remove the AC wiring harness assembly (J) from the shell assembly (C).

Replacement

1. Route the AC wiring harness assembly (J) through the cord retaining clips (K) inside the shell assembly (C).
2. Connect the corrugated hose (H) to the shell assembly (C).



CAUTION:

Use caution when lowering the shell assembly in place on the shell bottom. Ensure that no cables are pinched and that the extrusion bumper fits properly. Failure to do so could result in equipment damage.

3. Stand at the same end of the shell assembly (C) as the controller assembly (E), and perform the following (see figure 4-27 on page 4-56):
 - a. Connect the corrugated hose (H) to the check valve assembly (I).
 - b. Carefully lower the shell assembly (C) in place on the shell bottom (B).
 - c. Ensure that no cables are pinched between the shell assembly (C) and the shell bottom (B).
 - d. Ensure that the extrusion bumper (D) fits properly between the shell assembly (C) and the shell bottom (B).



CAUTION:

Always replace Nylok®¹ screws; do **not** reuse them. Equipment damage could occur.

4. Install the four new Nylok® screws (A) to secure the shell bottom (B) to the shell assembly (C).
5. If the unit is equipped with an oxygen system, install it (refer to procedure 7.2 on page 7-8).
6. If the unit is equipped with a humidity system, install it (refer to procedure 7.3 on page 7-14).
7. Install the heater assembly on the unit (refer to procedure 4.20 on page 4-49).
8. Install the impeller assembly on the unit (refer to procedure 4.8 on page 4-19).
9. Install the mattress, the mattress tray, and the x-ray tray on the unit (refer to procedure 4.7 on page 4-17).
10. Install the hood assembly on the unit (refer to procedure 4.5 on page 4-12).
11. Install the controller assembly in the shell assembly (refer to procedure 4.4 on page 4-10).
12. Plug the power cord into the controller assembly (A).
13. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

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4.23 Sensor Module-To-Controller Cable Assembly

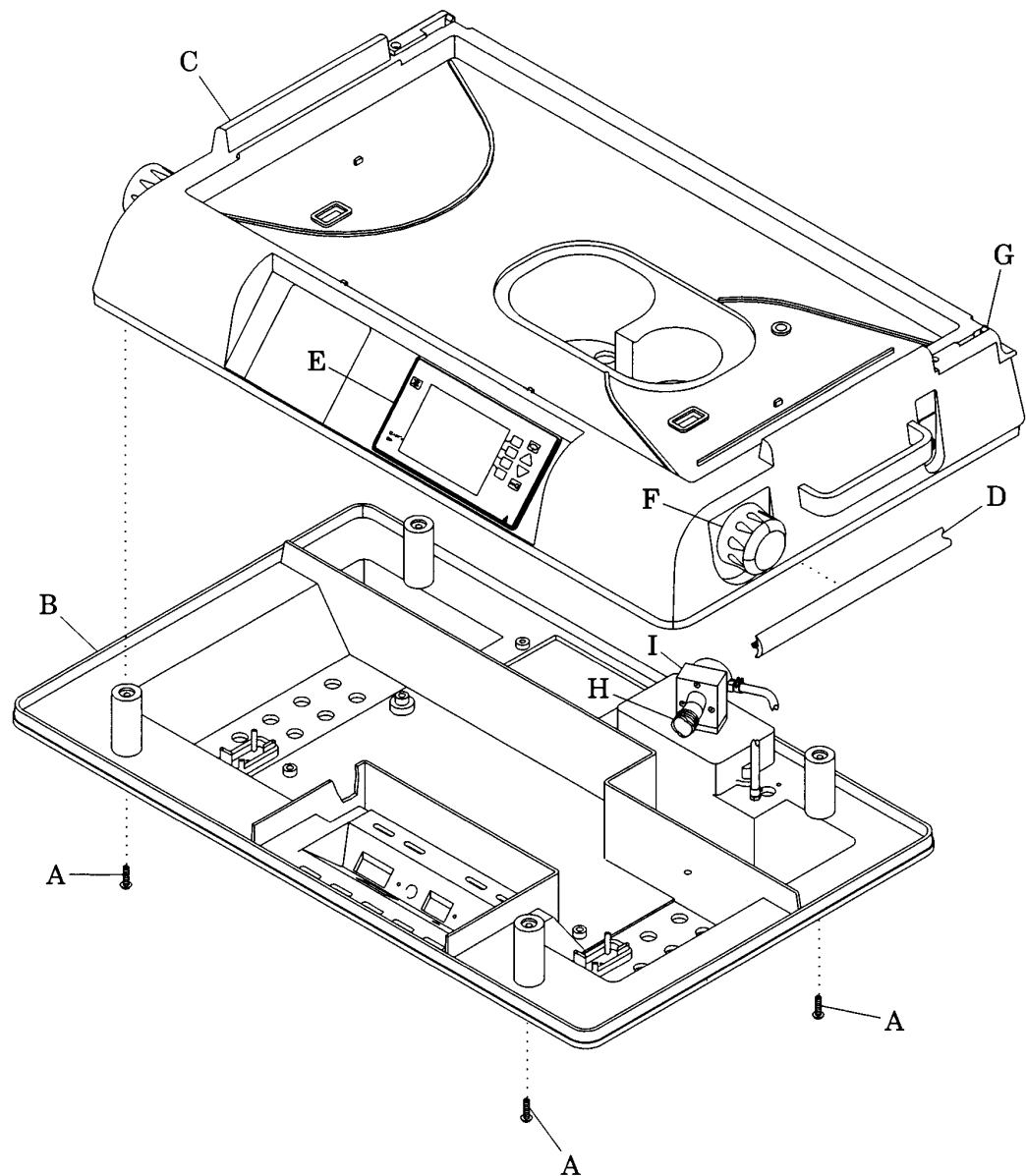
Tools required: Nut driver
Pliers
Flat padded surface

Removal

1. Remove the controller assembly from the shell assembly (refer to procedure 4.4 on page 4-10).
2. Remove the hood assembly from the unit (refer to procedure 4.5 on page 4-12).
3. Remove the mattress, the mattress tray, and the x-ray tray from the unit (refer to procedure 4.7 on page 4-17).
4. Remove the impeller assembly from the unit (refer to procedure 4.8 on page 4-19).
5. If the unit is equipped with a humidity system, remove it (refer to procedure 7.3 on page 7-14).
6. If the unit is equipped with an oxygen system, remove it (refer to procedure 7.2 on page 7-8).
7. Remove the four Nylok®¹ screws (A) that secure the shell bottom (B) to the shell assembly (C) (see figure 4-29 on page 4-60). **Discard** the four Nylok® screws (A).
8. Remove the extrusion bumper (D) from between the shell assembly (C) and the shell bottom (B).
9. Stand at the same end of the shell assembly (C) as the controller assembly (E), and perform the following:
 - a. Using the mattress tilt knob (F) and the rear hood hinge (G), lift the shell assembly (C) enough to access the corrugated hose (H) at the check valve assembly (I).
 - b. Using pliers, disconnect and remove the corrugated hose (H) from the shell assembly (C) and the shell bottom (D).
 - c. Carefully remove the shell assembly (C) from the shell bottom (B), and place it upside down on a flat, padded surface.

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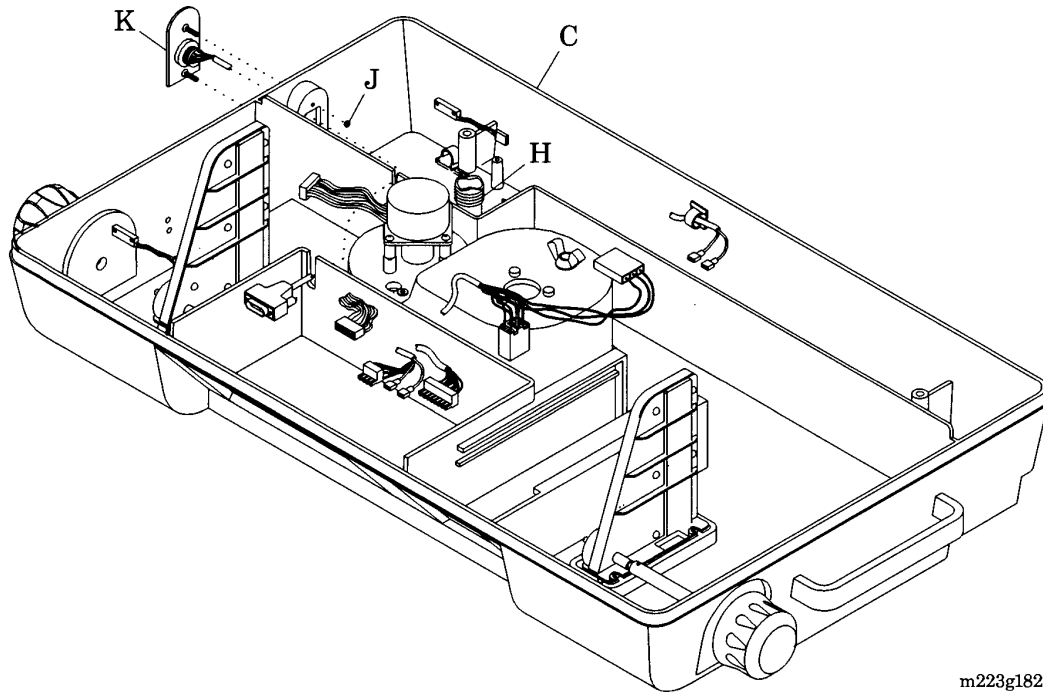
Figure 4-29. Shell Assembly



m223g181

10. Remove the two hex nuts (J) that secure the sensor module-to-controller cable assembly (K) to the shell assembly (C) (see figure 4-30 on page 4-61).

Figure 4-30. Sensor Module-to-Controller Cable Assembly



11. Carefully remove the sensor module-to-controller cable assembly (K) from the shell assembly (C).

Replacement

1. Route the sensor module-to-controller cable assembly (K) through the slots in the shell assembly (C).
2. Install the two hex nuts (J) to secure the sensor module-to-controller cable assembly (K) to the shell assembly (C).
3. Connect the corrugated hose (H) to the shell assembly (C).



CAUTION:

Use caution when lowering the shell assembly in place on the shell bottom. Ensure that no cables are pinched and that the extrusion bumper fits properly. Failure to do so could result in equipment damage.

4. Stand at the same end of the shell assembly (C) as the controller assembly (E), and perform the following (see figure 4-29 on page 4-60):
 - a. Connect the corrugated hose (H) to the check valve assembly (I).
 - b. Carefully lower the shell assembly (C) in place on the shell bottom (B).
 - c. Ensure that no cables are pinched between the shell assembly (C) and the shell bottom (B).
 - d. Ensure that the extrusion bumper (D) fits properly between the shell assembly (C) and the shell bottom (B).



CAUTION:

Always replace Nylok®¹ screws; do **not** reuse them. Equipment damage could occur.

5. Install the four new Nylok® screws (A) to secure the shell bottom (B) to the shell assembly (C).
6. If the unit is equipped with an oxygen system, install it (refer to procedure 7.2 on page 7-8).
7. If the unit is equipped with a humidity system, install it (refer to procedure 7.3 on page 7-14).
8. Install the impeller assembly (refer to procedure 4.8 on page 4-19).
9. Install the mattress, the mattress tray, and the x-ray tray on the unit (refer to procedure 4.7 on page 4-17).
10. Install the hood assembly on the unit (refer to procedure 4.5 on page 4-12).
11. Install the controller assembly (refer to procedure 4.4 on page 4-10).
12. Plug the power cord into the controller assembly (E).
13. To ensure proper operation of the Isolette® Infant Incubator, perform the "Function Checks" on page 2-6.

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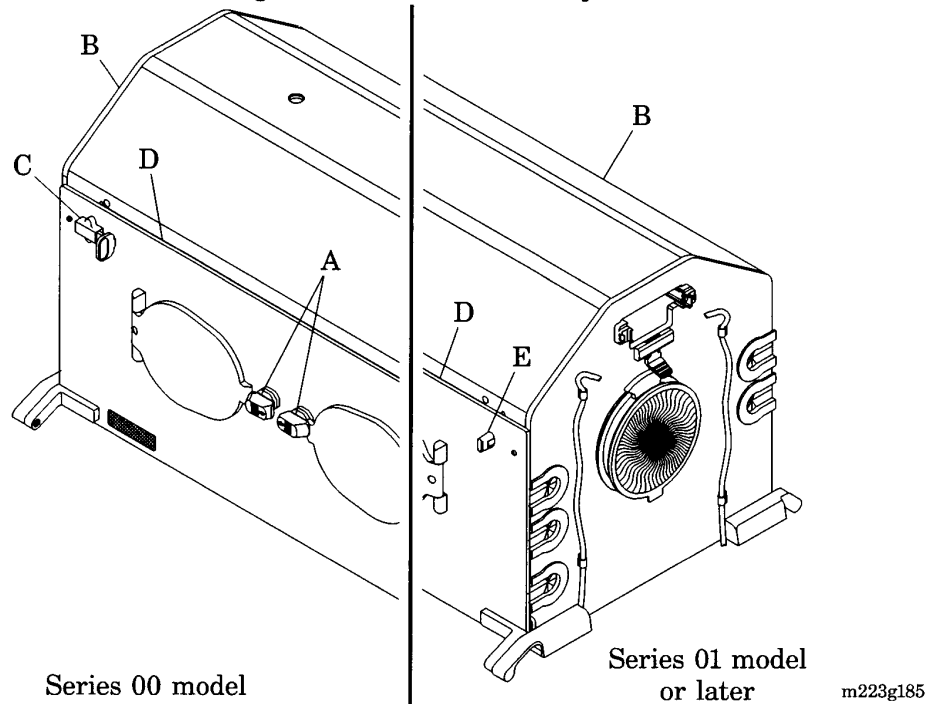
4.24 Access Panel Pawl Latch and Knob Assembly

Tools required: Pliers (two pair)
Clean cloth

Removal

1. Release the access door latch (A) (see figure 4-31 on page 4-63).

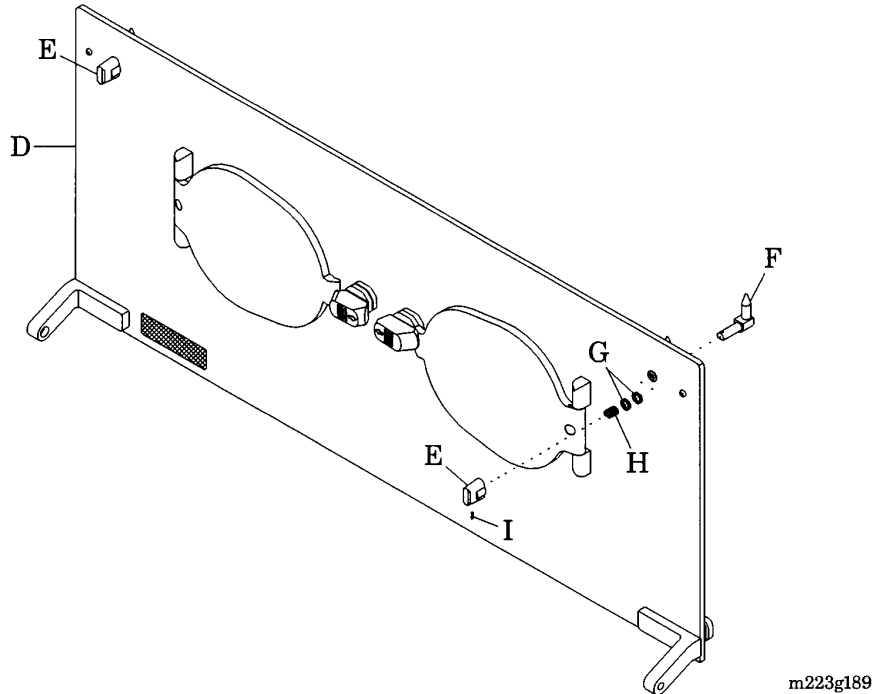
Figure 4-31. Hood Assembly



2. On a unit with a Series 00 hood assembly (B), slide the blue slide access panel latches (C), and open the access panel (D).
or
On a unit with a hood assembly (B) later than Series 00, rotate the pawl latch knobs (E), and open the access panel (D).
3. Pivot the access panel (D) to the full-open position so it hangs straight down.

4. Using two pair of pliers, grasp the pawl latch (F) and the pawl latch knob (E) (see figure 4-32 on page 4-64).

Figure 4-32. Access Panel Knob and Latch Assembly



5. Twist and pull the pawl latch (F) and the pawl latch knob (E) in opposite directions until they separate.
6. Remove the pawl latch (F), the pawl latch knob (E), the two spacers (G), the compression spring (H), and the spring pin (I) from the access panel (D).

Replacement

1. From the inside of the access panel (D), slide the stem of the pawl latch (F) into the access panel (D).
2. From the outside of the access panel (D), perform the following:
 - a. Install the two spacers (G) and the compression spring (H) onto the stem of the pawl latch (F).
 - b. Install the pawl latch knob (E) onto the stem of the pawl latch (F).

- c. Insert the spring pin (I) into its opening in the pawl latch knob (E) and the pawl latch (F).
 - d. Place a clean cloth over the spring pin (I), and use pliers to press the spring pin (I) firmly into the pawl latch knob (E) to secure it to the pawl latch (F). Ensure that the spring pin (I) is flush with the pawl latch knob (E).
3. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

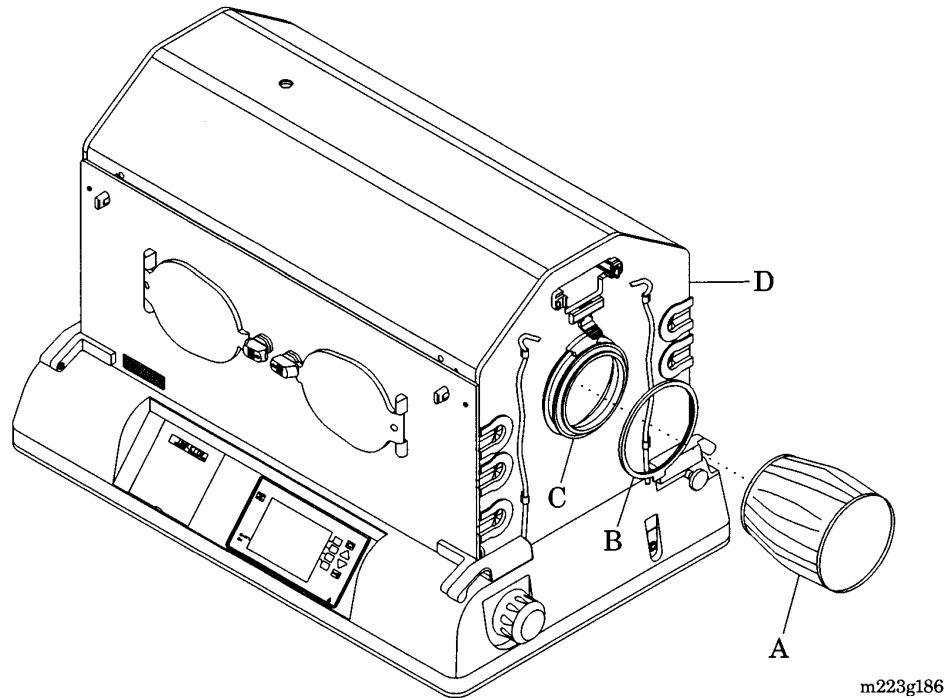
4.25 Iris Entry Port Retaining Rings

Tools required: None

Removal

1. Remove the iris entry port sleeve (A) from the iris entry port ring assembly (B) (see figure 4-33 on page 4-66) (refer to procedure 4.11 on page 4-30).

Figure 4-33. Iris Entry Port Retaining Rings



2. Remove the iris entry port retaining ring (C) from the iris entry port ring assembly (B).
3. If necessary, turn the iris entry port ring assembly (B) counterclockwise to remove it from the hood assembly (D).

Replacement

1. Perform the removal procedure in reverse order.
2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

4.26 Access Door Cuff

Tools required: None

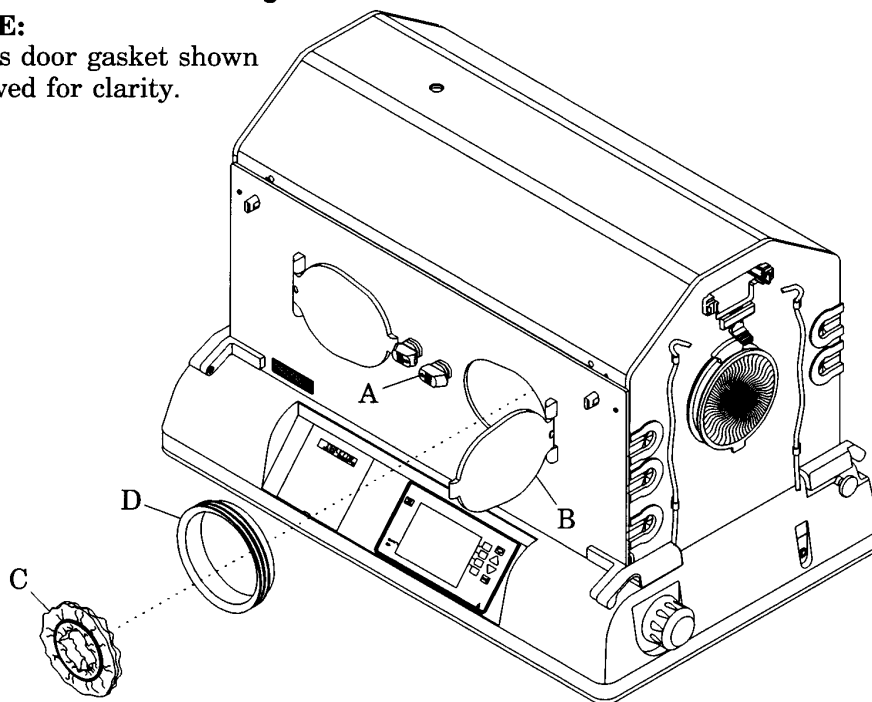
Removal

1. Press the access door latch (A), and open the access door (B) (see figure 4-34 on page 4-67).

Figure 4-34. Access Door Gasket

NOTE:

Access door gasket shown removed for clarity.



m223g198

2. Gently pull the access door cuff (C) from the access door gasket (D).

Replacement

1. Stretch the larger diameter elastic band of the access door cuff (C) into the groove in the access door gasket (D).
2. Ensure proper installation of the access door cuff (C) by checking the following:
 - The access door cuff (C) has a small opening at its center.
 - The access door (B) latches with slight pressure and opens when the access door latch (A) is pressed.

3. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

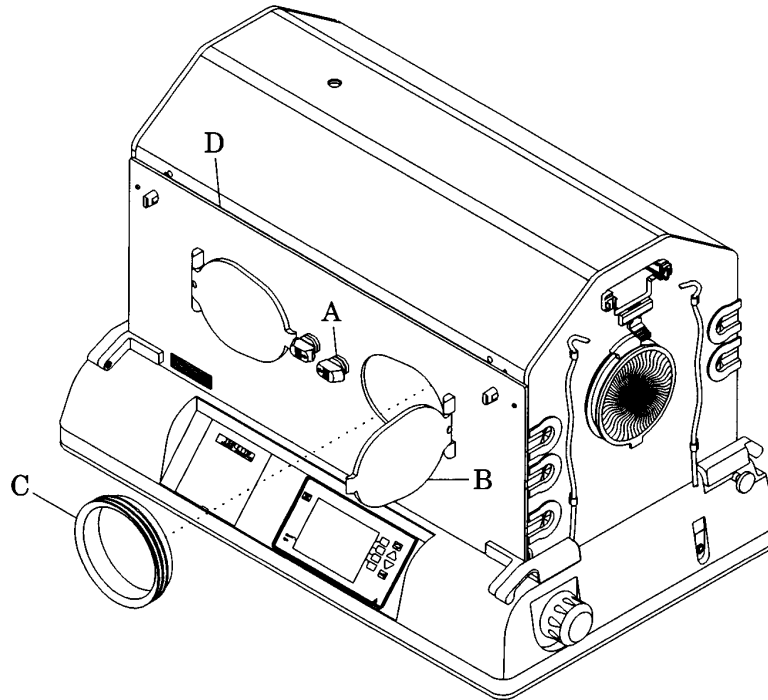
4.27 Access Door Gasket

Tools required: None

Removal

1. Press the access door release (A), and open the access door (B) (see figure 4-35 on page 4-69).

Figure 4-35. Access Door Gasket



m223g187

2. Remove the access door cuff from the access door gasket (refer to procedure 4.26 on page 4-67).
3. Carefully separate the access door gasket (C) from its opening in the access panel (D), and remove it from the unit.

Replacement

1. Perform the removal procedure in reverse order.
2. To ensure proper operation of the Isolette® Infant Incubator, perform the "Function Checks" on page 2-6.

4.28 Pivot/Hook Lock Assembly Bracket

Tools required: Phillips head screwdriver
 Ruler
 Pencil
 Small hack saw
 Emery board
 ¼-pint can of touch-up putty paint (P/N 83 900 69)

Removal

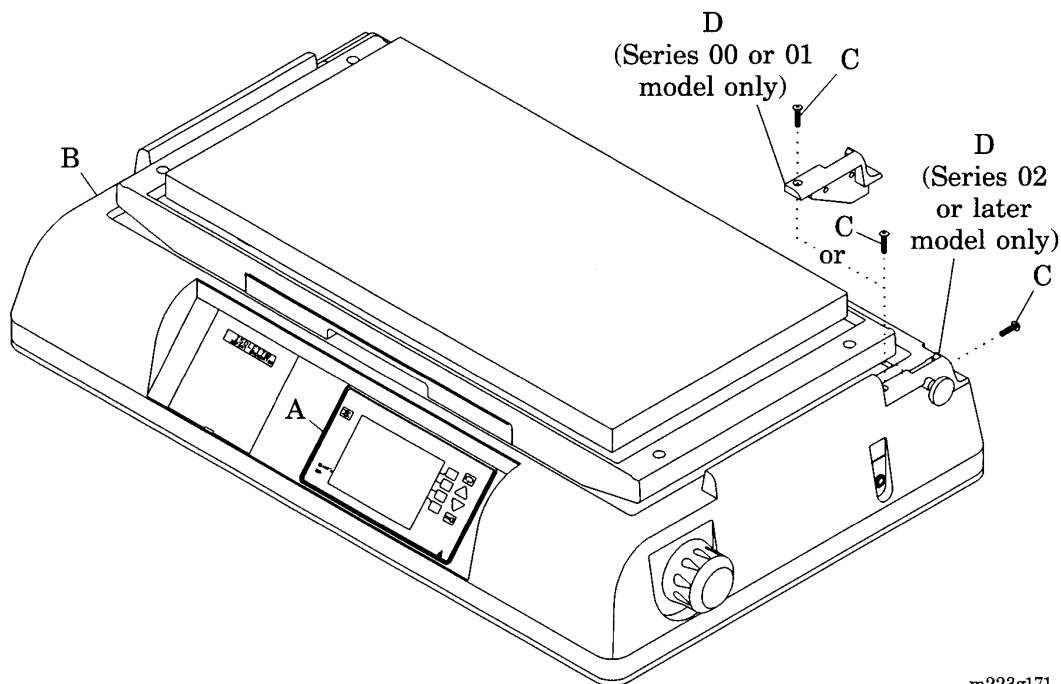


SHOCK HAZARD:

Unplug the power cord from the controller assembly. Failure to do so could result in personal injury or equipment damage.

1. Unplug the power cord from the controller assembly (A) (see figure 4-36 on page 4-70).

Figure 4-36. Pivot/Hook Lock Assembly Bracket



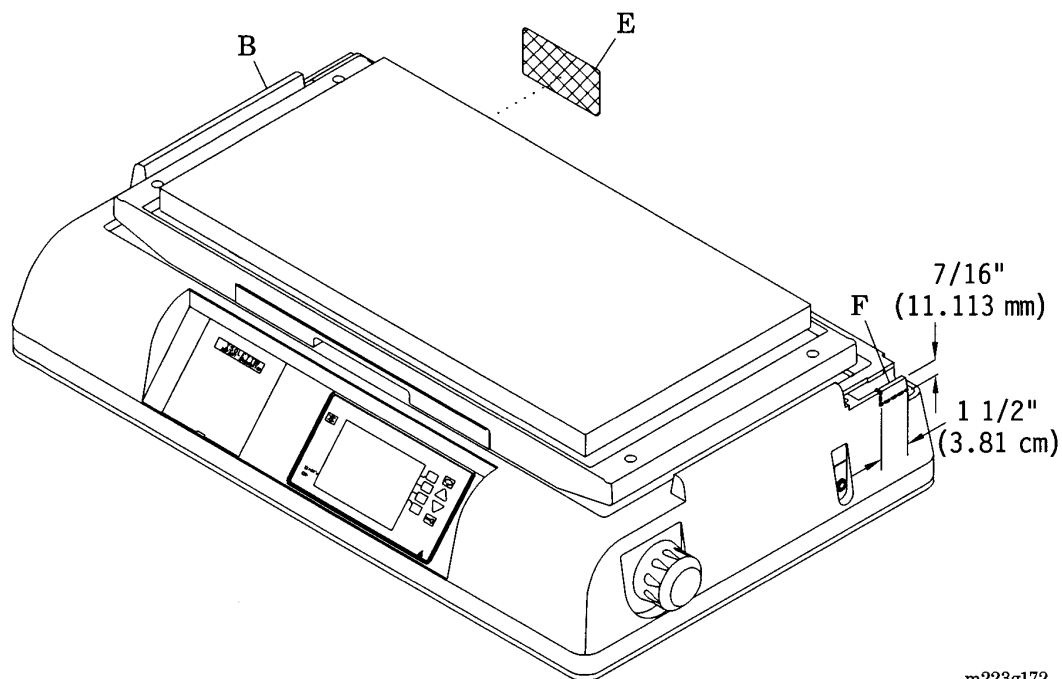
2. Remove the hood assembly from the shell assembly (refer to procedure 4.5 on page 4-12).

3. Remove the one or two Nylok®¹ screws (C) that secure the pivot/hook lock assembly bracket (D) to the shell assembly (B). **Discard** the two Nylok® screws (C).
4. Remove the pivot/hook lock assembly bracket (D) from the shell assembly (B).

Replacement

1. Refer to the data tag (E) on the back of the shell assembly (B) to check the series number (see figure 4-37 on page 4-71):

Figure 4-37. Series 00 or 01 Model Shell Assembly



m223g172

- If the shell assembly (B) is a **Series 02 or later** model, go to step 2.
- If the shell assembly (B) is a **Series 00 or 01** model, perform the following:
 - a. Using a ruler and pencil, measure and mark a 7/16" (11.113 mm) x 1 1/2" (3.81 cm) notch at the rear corner of the shell assembly (B).
 - b. Using a small hack saw, remove the marked notch (F) from the shell assembly (B).

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- c. Using an emery board, smooth any rough edges of the notch (F).
- d. Apply touch-up paint as required.



CAUTION:

Always replace Nylok® screws; do **not** reuse them. Equipment damage could occur.

- 2. Install one or two new Nylok® screws (C) to secure the pivot/hook lock assembly bracket (D) to the shell assembly (B) (see figure 4-36 on page 4-70).
- 3. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

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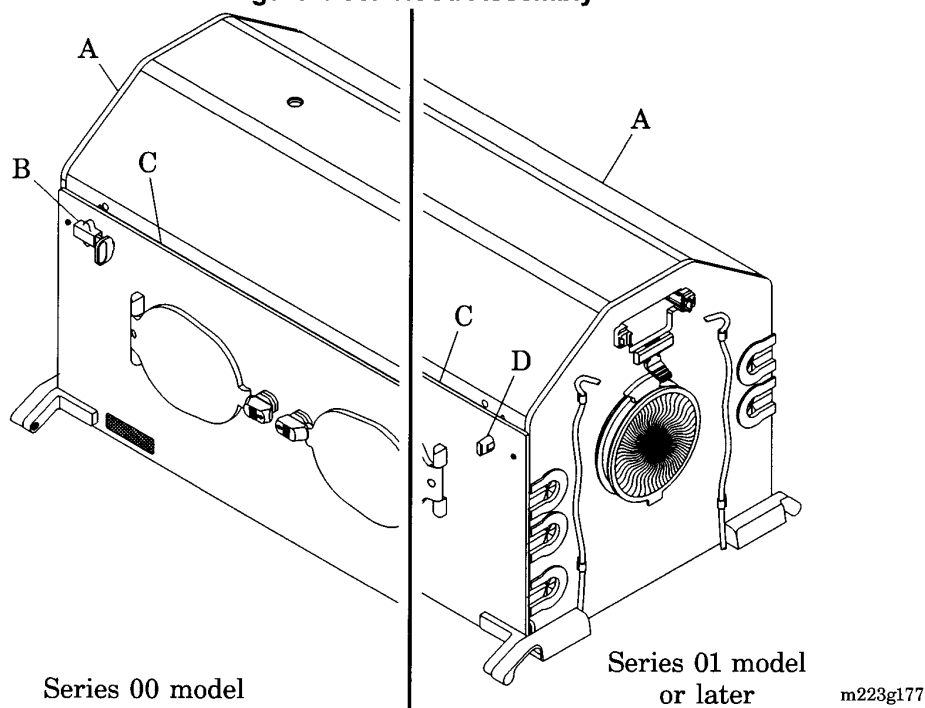
4.29 Heat Shield Latch

Tools required: Phillips head screwdriver

Removal

1. On a unit with a Series 00 hood assembly (A), slide the blue slide access panel latches (B), and open the access panel (C) (see figure 4-38 on page 4-73).
or
On a unit with a hood assembly (A) later than Series 00, rotate the access panel pawl latch knobs (D), and open the access panel (C).

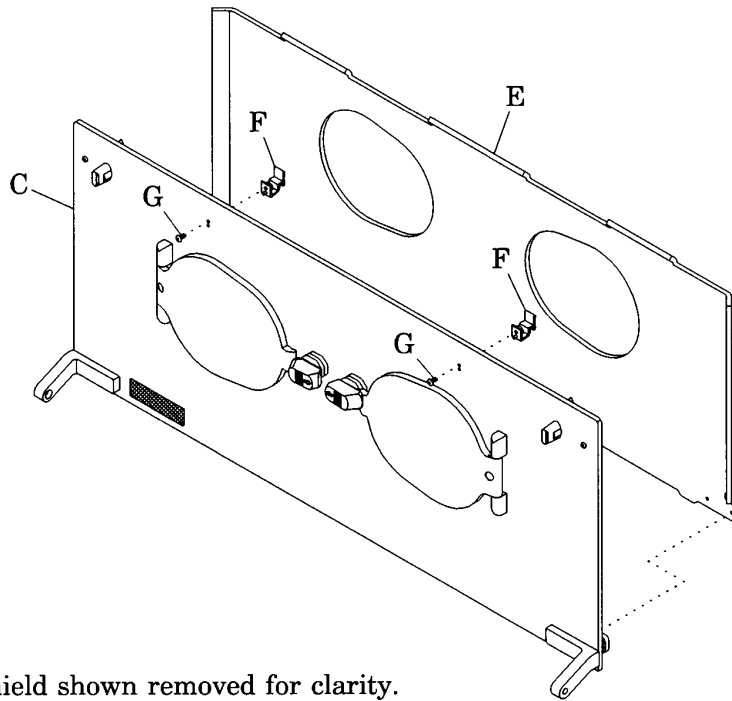
Figure 4-38. Hood Assembly



2. Pivot the access panel (C) to the full-open position so it hangs straight down.

3. Release the heat shield (E) from the access panel (C) by pressing on the two heat shield latches (F) (see figure 4-39 on page 4-74).

Figure 4-39. Heat Shield Latch



NOTE:
Heat shield shown removed for clarity.

m223g178

4. Remove the Nylok® screw (G) that secures the heat shield latch (F) to the access panel (C). **Discard** the Nylok® screw (G).
5. Remove the heat shield latch (F) from the access panel (C).

Replacement



CAUTION:

Always replace Nylok® screws; do **not** reuse them. Equipment damage could occur.

1. Replace the Nylok® screw (G), and perform the removal procedure in reverse order.
2. To ensure proper operation of the Isolette® Infant Incubator, perform the "Function Checks" on page 2-6.

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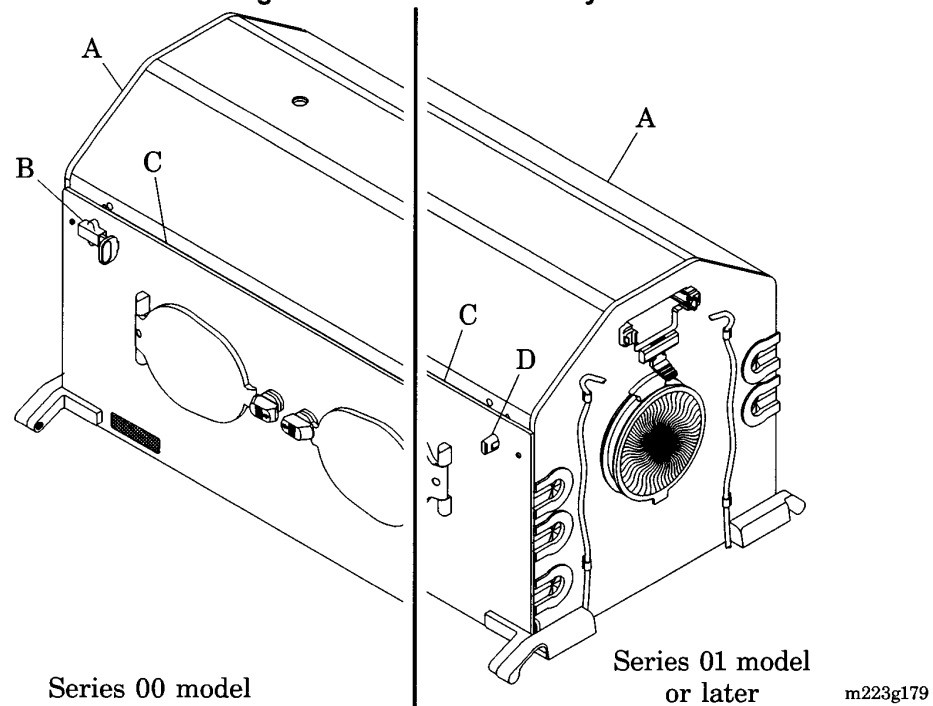
4.30 Heat Shield

Tools required: Phillips head screwdriver

Removal

1. On a unit with a Series 00 hood assembly (A), slide the blue slide access panel latches (B), and open the access panel (C) (see figure 4-40 on page 4-75).
or
On a unit with a hood assembly (A) later than Series 00, rotate the access panel pawl latch knobs (D), and open the access panel (C).

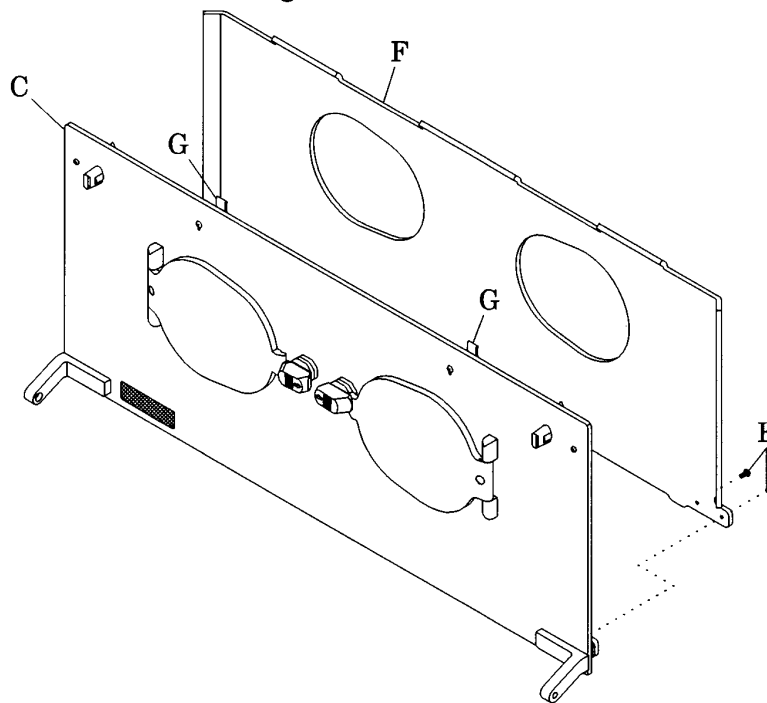
Figure 4-40. Hood Assembly



2. Pivot the access panel (C) to the full-open position so it hangs straight down.

3. Remove the four self-tapping screws (E) that secure the heat shield (F) to the access panel (C) (see figure 4-41 on page 4-76).

Figure 4-41. Heat Shield



m223g180

4. Release the heat shield (F) from the access panel (C) by pressing on the two heat shield latches (G).

Replacement

1. Perform the removal procedure in reverse order.
2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

4.31 Mattress Tilt Knob

Tools required: Small screwdriver
Phillips head screwdriver
9/64" Allen™ wrench
Flat padded surface
Needle-nose pliers
Pliers

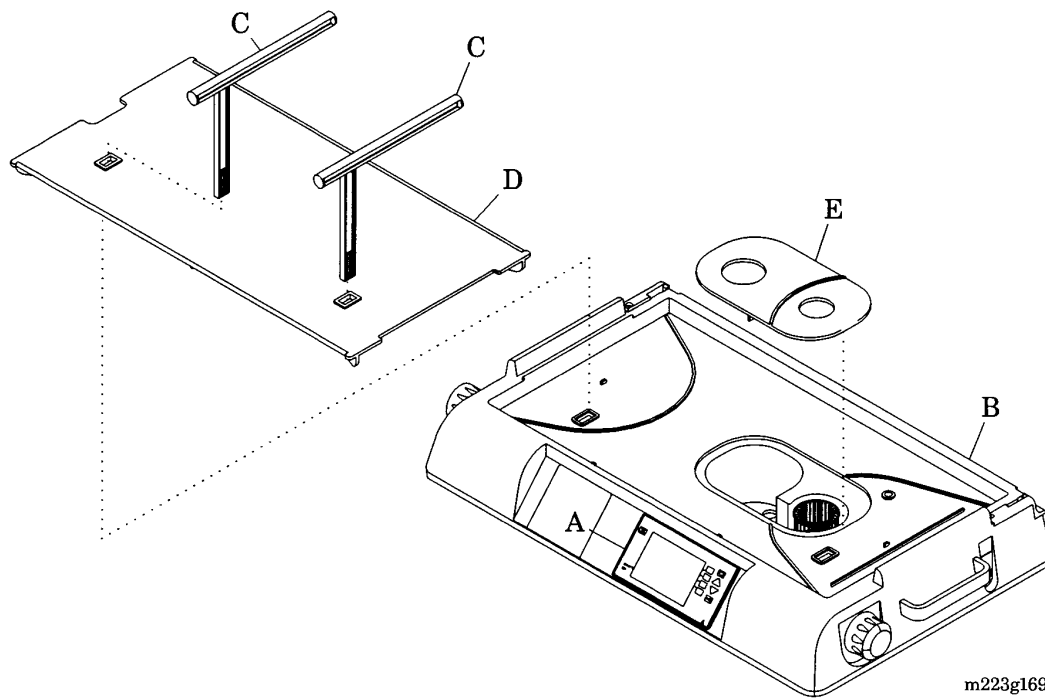
Removal

**SHOCK HAZARD:**

Unplug the power cord from the controller assembly. Failure to do so could result in personal injury or equipment damage.

1. Unplug the power cord from the controller assembly (A) (see figure 4-42 on page 4-77).

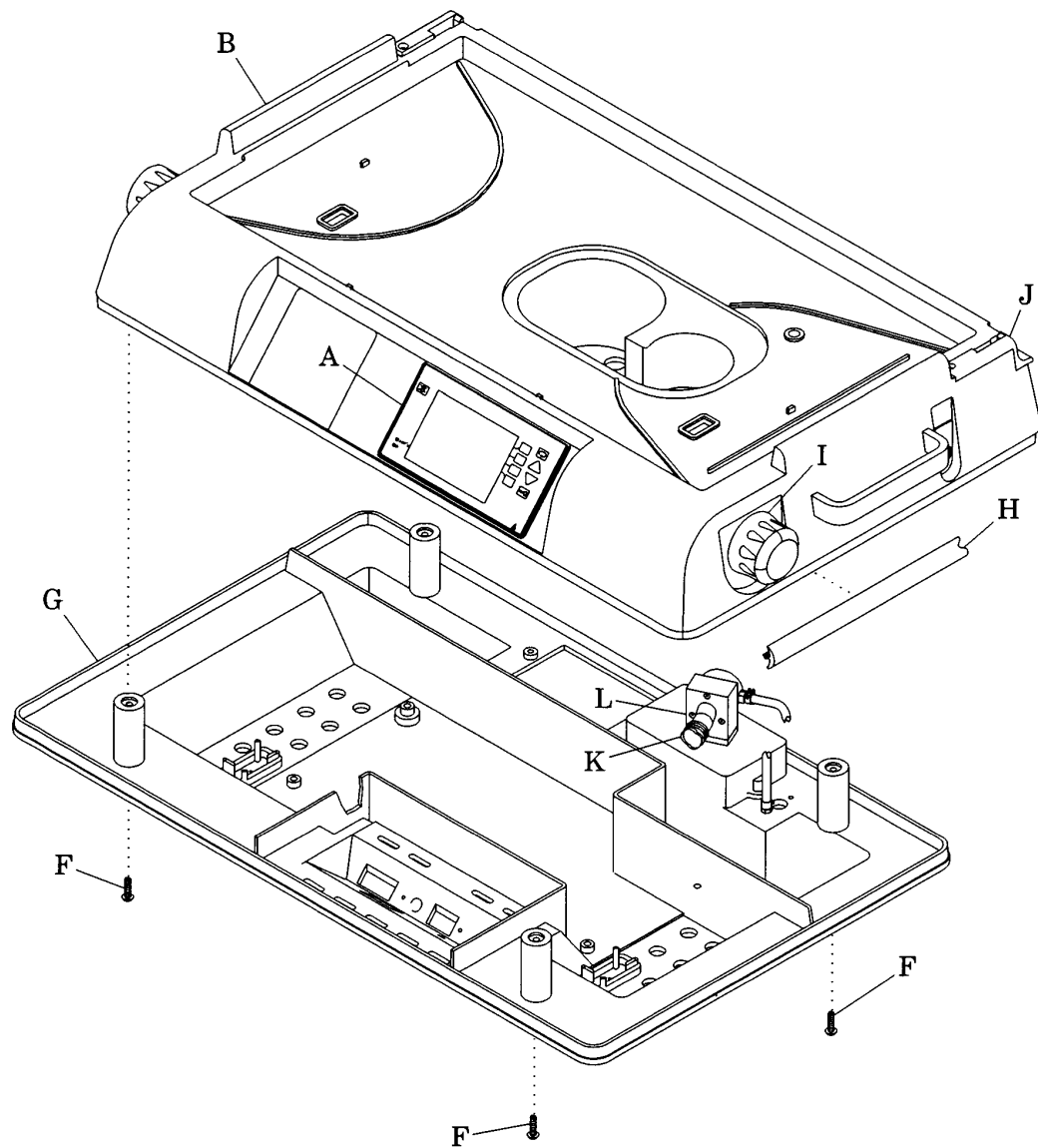
Figure 4-42. Shell Assembly



1. Allen™ is a trademark of Industrial Fasteners, Inc.

2. Remove the controller assembly from the shell assembly (refer to procedure 4.4 on page 4-10).
3. Remove the hood assembly from the unit (refer to procedure 4.5 on page 4-12).
4. Remove the mattress, the mattress tray, and the x-ray tray from the unit (refer to procedure 4.7 on page 4-17).
5. Pull the two mattress tilt bars (C) up through the main deck (D), and remove them from the unit.
6. Remove the main deck (D) from the unit.
7. Remove the heater/impeller cover (E) from the unit.
8. If the unit is equipped with a humidity system, remove it (refer to procedure 7.3 on page 7-14).
9. If the unit is equipped with an oxygen system, remove it (refer to procedure 7.2 on page 7-8).
10. Remove the four Nylok®¹ screws (F) that secure the shell bottom (G) to the shell assembly (B) (see figure 4-43 on page 4-79). **Discard** the four Nylok® screws (F).
11. Remove the extrusion bumper (H) from between the shell assembly (B) and the shell bottom (G).
12. Stand at the same end of the shell assembly (B) as the controller assembly (A), and perform the following:
 - a. Using the mattress tilt knob (I) and the rear hood hinge (J), lift the shell assembly (B) enough to access the corrugated hose (K) at the check valve assembly (L).
 - b. Using pliers, disconnect and remove the corrugated hose (K) from the shell assembly (B) and the shell bottom (G).
 - c. Carefully remove the shell assembly (B) from the shell bottom (G), and place it upside down on a flat padded surface.

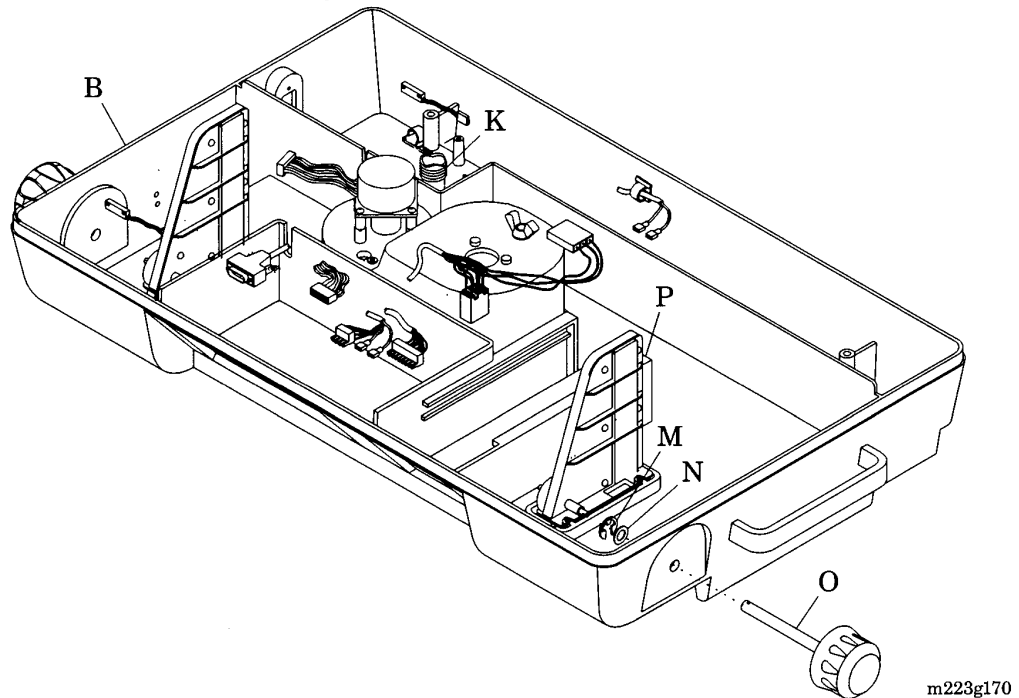
1. Nylok® is a registered trademark of Nylok Fastener Corporation.

Figure 4-43. Shell Bottom

m223g168

13. Using needle-nose pliers, remove the e-ring (M) and flat washer (N) that secure the knob shaft (O) to the tilt mechanism (P) (see figure 4-44 on page 4-80).

Figure 4-44. Mattress Tilt Knob



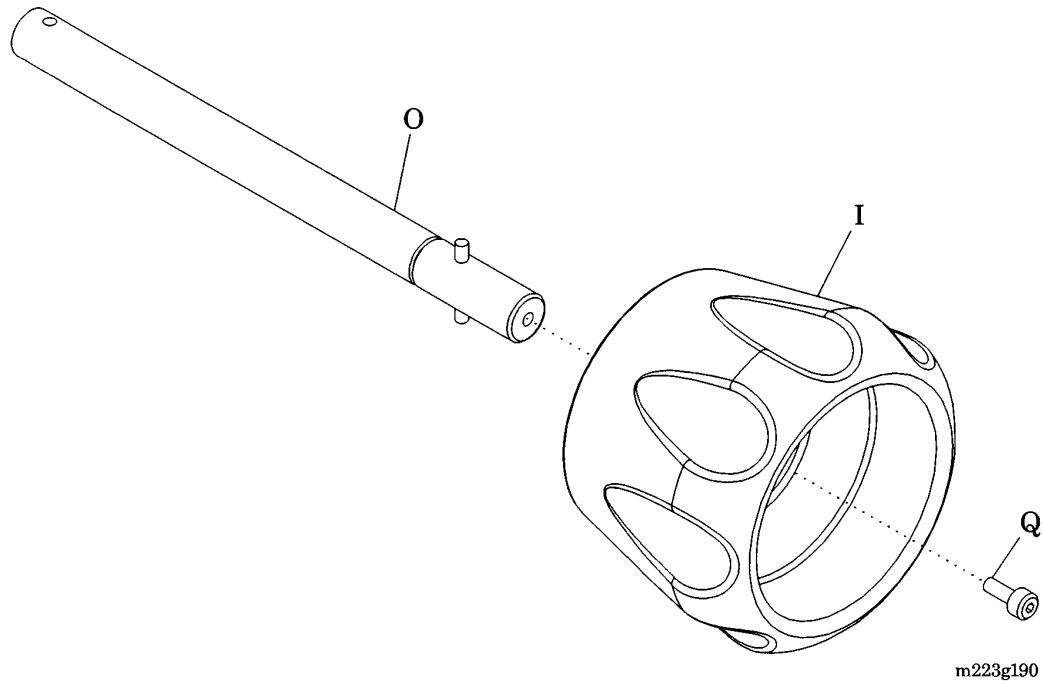
14. Remove the knob shaft (O) from the shell assembly (B).

Replacement

1. Install the flat washer (N) on the knob shaft (O).
2. Insert the notched end of the knob shaft (O) into the shell assembly (B) until it engages the tilt mechanism (P).
3. Using needle-nose pliers, install the e-ring (M) to secure the knob shaft (O) to the tilt mechanism (P)

4. Using a 9/64" Allen™¹ wrench, install the Nylok®² cap screw (Q) to secure the mattress tilt knob (I) to the knob shaft (O) (see figure 4-45 on page 4-81).

Figure 4-45. Mattress Tilt Knob Assembly



5. Connect the corrugated hose (K) to the shell assembly (B) (see figure 4-44 on page 4-80).



CAUTION:

Use caution when lowering the shell assembly in place on the shell bottom. Ensure that no cables are pinched and that the extrusion bumper fits properly. Failure to do so could result in equipment damage.

6. Stand at the same end of the shell assembly (B) as the controller assembly (A), and perform the following (see figure 4-43 on page 4-79):
 - a. Connect the corrugated hose (K) to the check valve assembly (L).
 - b. Carefully lower the shell assembly (B) in place on the shell bottom (G).

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2. Nylok® is a registered trademark of Nylok Fastener Corporation.

- c. Ensure that no cables are pinched between the shell assembly (B) and the shell bottom (G).
- d. Ensure that the extrusion bumper (H) fits properly between the shell assembly (B) and the shell bottom (G).



CAUTION:

Always replace Nylok® screws; do **not** reuse them. Equipment damage could occur.

- 7. Install four new Nylok® screws (F) to secure the shell bottom (G) to the shell assembly (B).
- 8. If the unit is equipped with an oxygen system, install it (refer to procedure 7.2 on page 7-8).
- 9. If the unit is equipped with a humidity system, install it (refer to procedure 7.3 on page 7-14).
- 10. Install the heater/impeller cover (E) on the unit (see figure 4-42 on page 4-77).
- 11. Install the main deck (D) on the unit.
- 12. Slide the two mattress tilt bars (C) through their slots in the main deck (D).
- 13. Install the mattress, the mattress tray, and the x-ray tray on the unit (refer to procedure 4.7 on page 4-17).
- 14. Install the hood assembly on the unit (refer to procedure 4.5 on page 4-12).
- 15. Install the controller assembly in the shell assembly (refer to procedure 4.4 on page 4-10).
- 16. Plug the power cord into the controller assembly (A).
- 17. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

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4.32 Mattress Tilt Mechanism

Tools required: Phillips head screwdriver
 Pliers
 Flat padded surface

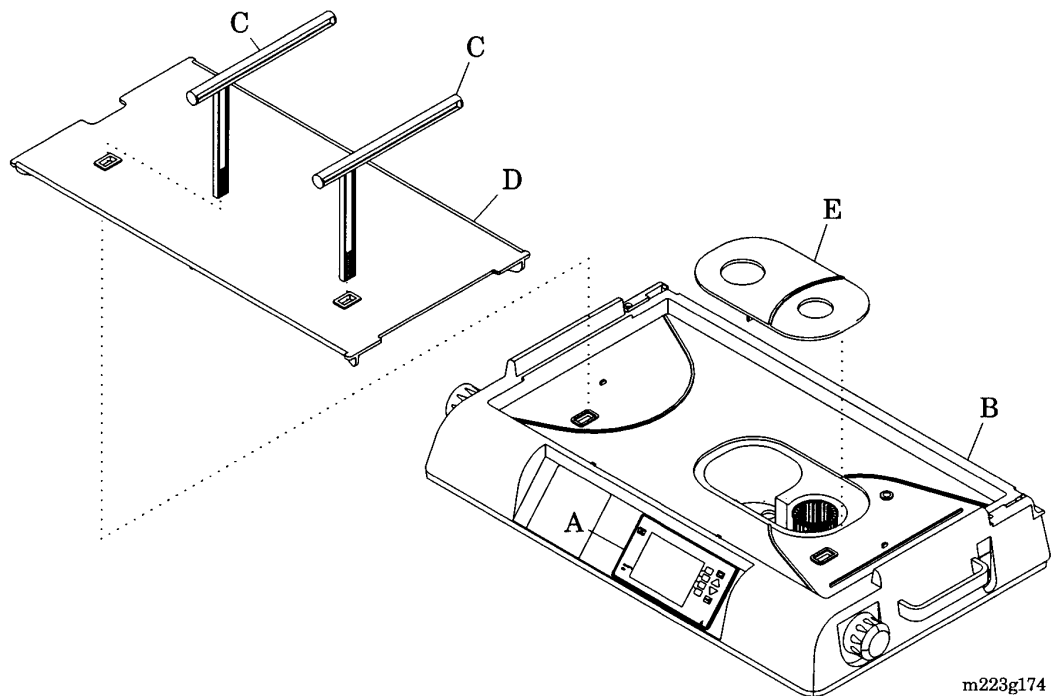
Removal

**SHOCK HAZARD:**

Unplug the power cord from the controller assembly. Failure to do so could result in personal injury or equipment damage.

1. Unplug the power cord from the controller assembly (A) (see figure 4-46 on page 4-83).

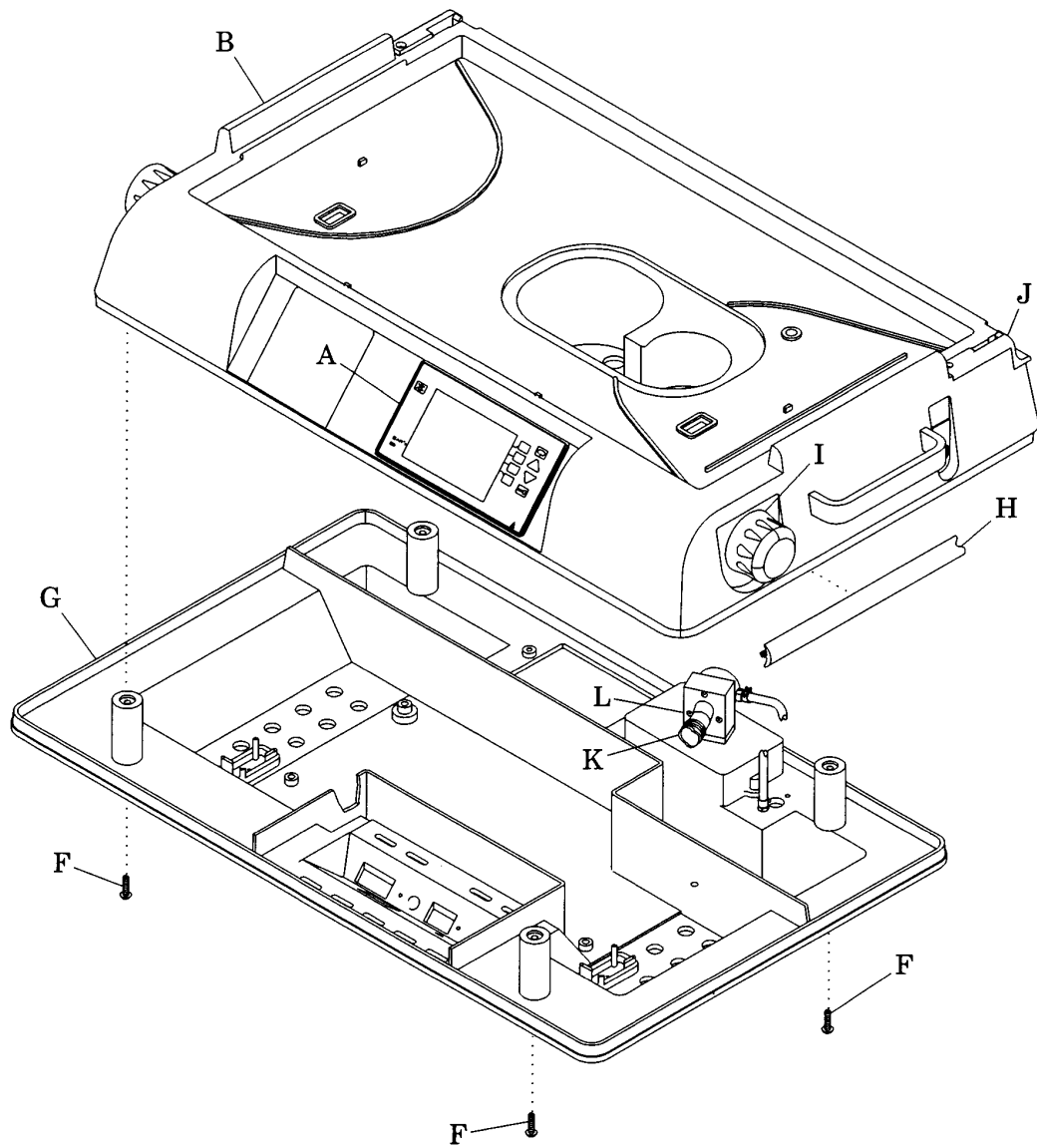
Figure 4-46. Shell Assembly



2. Remove the controller assembly from the shell assembly (refer to procedure 4.4 on page 4-10).
3. Remove the hood assembly from the unit (refer to procedure 4.5 on page 4-12).

4. Remove the mattress, the mattress tray, and the x-ray tray from the unit (refer to procedure 4.7 on page 4-17).
5. Pull the two mattress tilt bars (C) up through the main deck (D), and remove them from the unit.
6. Remove the main deck (D) from the unit.
7. Remove the heater/impeller cover (E) from the unit.
8. If the unit is equipped with a humidity system, remove it (refer to procedure 7.3 on page 7-14).
9. If the unit is equipped with an oxygen system, remove it (refer to procedure 7.2 on page 7-8).
10. Remove the four Nylok®¹ screws (F) that secure the shell bottom (G) to the shell assembly (B) (see figure 4-47 on page 4-85). **Discard** the four Nylok® screws (F).
11. Remove the extrusion bumper (H) from between the shell assembly (B) and the shell bottom (G).
12. Stand at the same end of the shell assembly (B) as the controller assembly (A), and perform the following:
 - a. Using the mattress tilt knob (I) and the rear hood hinge (J), lift the shell assembly (B) enough to access the corrugated hose (K) at the check valve assembly (L).
 - b. Using pliers, disconnect and remove the corrugated hose (K) from the shell assembly (B) and the shell bottom (G).
 - c. Carefully remove the shell assembly (B) from the shell bottom (G), and place it upside down on a flat padded surface.
13. Remove the mattress tilt knob from the tilt mechanism (refer to procedure 4.31 on page 4-77).

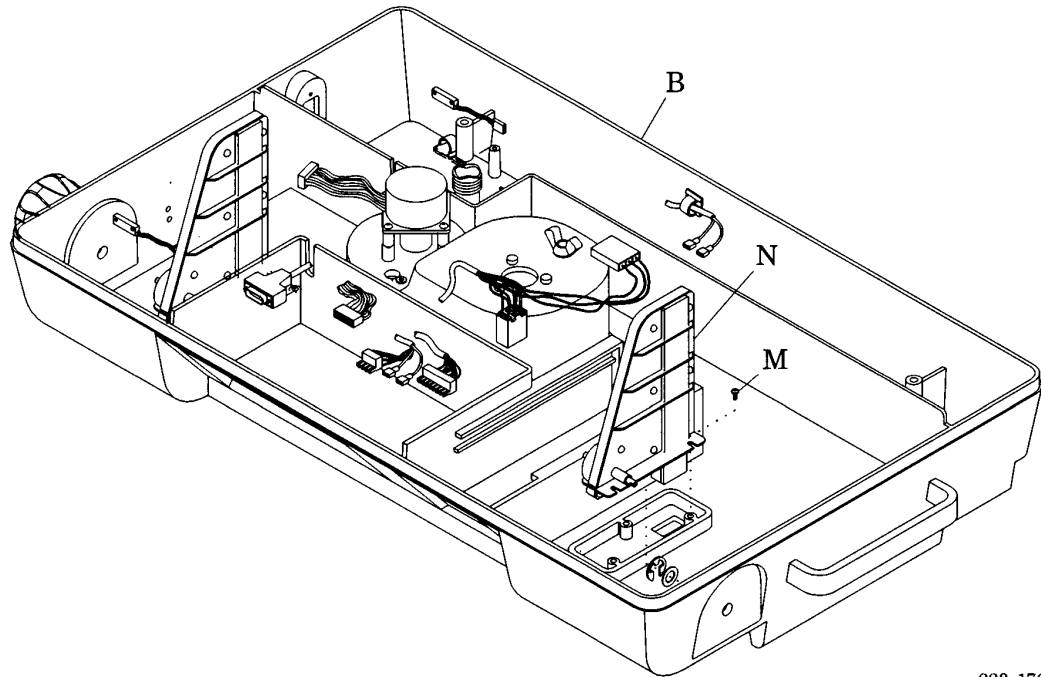
1. Nylok® is a registered trademark of Nylok Fastener Corporation.

Figure 4-47. Shell Bottom

m223g175

14. Remove the three Nylok®¹ screws (M) that secure the tilt mechanism (N) to the shell assembly (B) (see figure 4-48 on page 4-86). **Discard** the three Nylok® screws (M).

Figure 4-48. Mattress Tilt Mechanism



15. Remove the tilt mechanism (N) from the shell assembly (B).

Replacement



CAUTION:

Always replace Nylok® screws; do **not** reuse them. Equipment damage could occur.

1. Replace the Nylok® screws (F (see figure 4-47 on page 4-85) and M (see figure 4-48 on page 4-86)), and perform the removal procedure in reverse order.
2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

1. Nylok® is a registered trademark of Nylok Fastener Corporation.

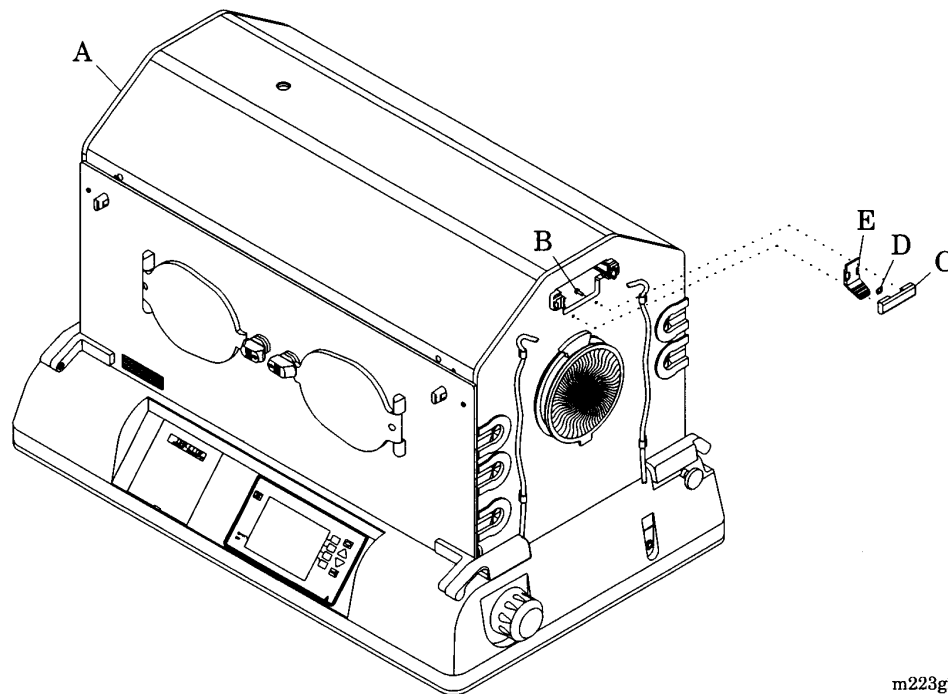
4.33 Sensor Module Lock (Models with Sensor Module Lock Only)

Tools required: Phillips head screwdriver

Removal

1. Remove the sensor module assembly from the hood assembly (refer to procedure 4.2 on page 4-6).
2. From inside the hood assembly (A), remove the two Nylok®¹ screws (B) that secure the slide fixture cover plate (C) to the hood assembly (A) (see figure 4-49 on page 4-87).

Figure 4-49. Sensor Module Lock



m223g163

3. Remove the slide fixture cover plate (C), the curved spring washer (D), and the slide lock (E) from the hood assembly (A).

1. Nylok® is a registered trademark of Nylok Fastener Corporation.

Replacement

1. Install the curved spring washer (D) in the slide fixture cover plate (C).
2. Install the slide lock (E) over the curved spring washer (D).



CAUTION:

Always replace Nylok® screws; do **not** reuse them. Equipment damage could occur.

3. From inside the hood assembly (A), install two new Nylok® screws (B) to secure the slide fixture cover plate (C) to the hood assembly (A).
4. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

1. Nylok® is a registered trademark of Nylok Fastener Corporation.

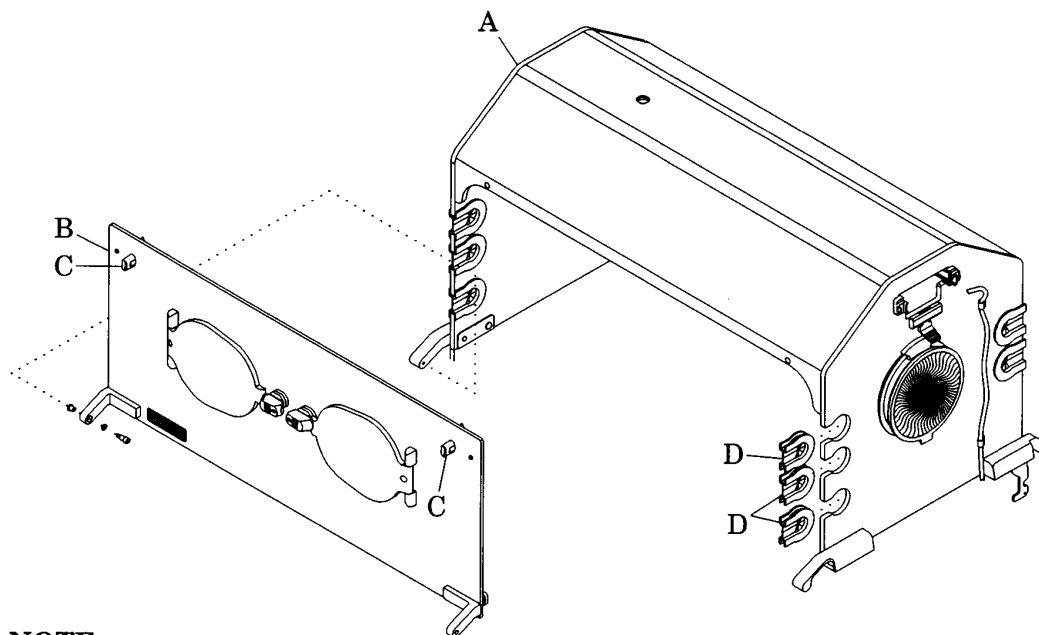
4.34 Access Grommet

Tools required: None

Removal

1. On a unit with a Series 00 hood assembly (A), slide the blue slide access panel latches, and open the access panel (B) (see figure 4-17 on page 4-35).
or
On a unit with a hood assembly (A) later than Series 00, rotate the access panel pawl latch knobs (C), and open the access panel (B).

Figure 4-50. Access Grommet



NOTE:

Access panel shown removed for clarity.

m223g173

2. Pivot the access panel (B) to the full-open position so it hangs straight down.
3. Remove any wiring or cables from the access grommet (D).
4. Remove the access grommet (D) from the hood assembly (A).

Replacement

1. Perform the removal procedure in reverse order.
2. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

4.35 Upper Transition Plate

Tools required: 5 mm hex key **or** 3/16" hex key

Removal



SHOCK HAZARD:

Unplug the unit from its power source. Failure to do so could result in personal injury or equipment damage.

1. Unplug the unit from its power source.
2. Remove the hood assembly from the unit (refer to procedure 4.5 on page 4-12).
3. Remove the shell assembly from the unit.
4. On a **variable-height adjustable stand**, use a 5 mm hex key to remove the four screws (A) and the four lockwashers (B) that secure the upper transition plate (C) to the upper column (D) (see figure 4-51 on page 4-92). **Retain** the four screws (A) and the four lockwashers (B).
or
On a **fixed-height pedestal stand**, use a 3/16" hex key to remove the four screws (A) and the four lockwashers (B) that secure the upper transition plate (C) to the upper column (D) (see figure 4-51 on page 4-92). **Retain** the four screws (A) and the four lockwashers (B).
5. Remove the upper transition plate (C) from the upper column (D).

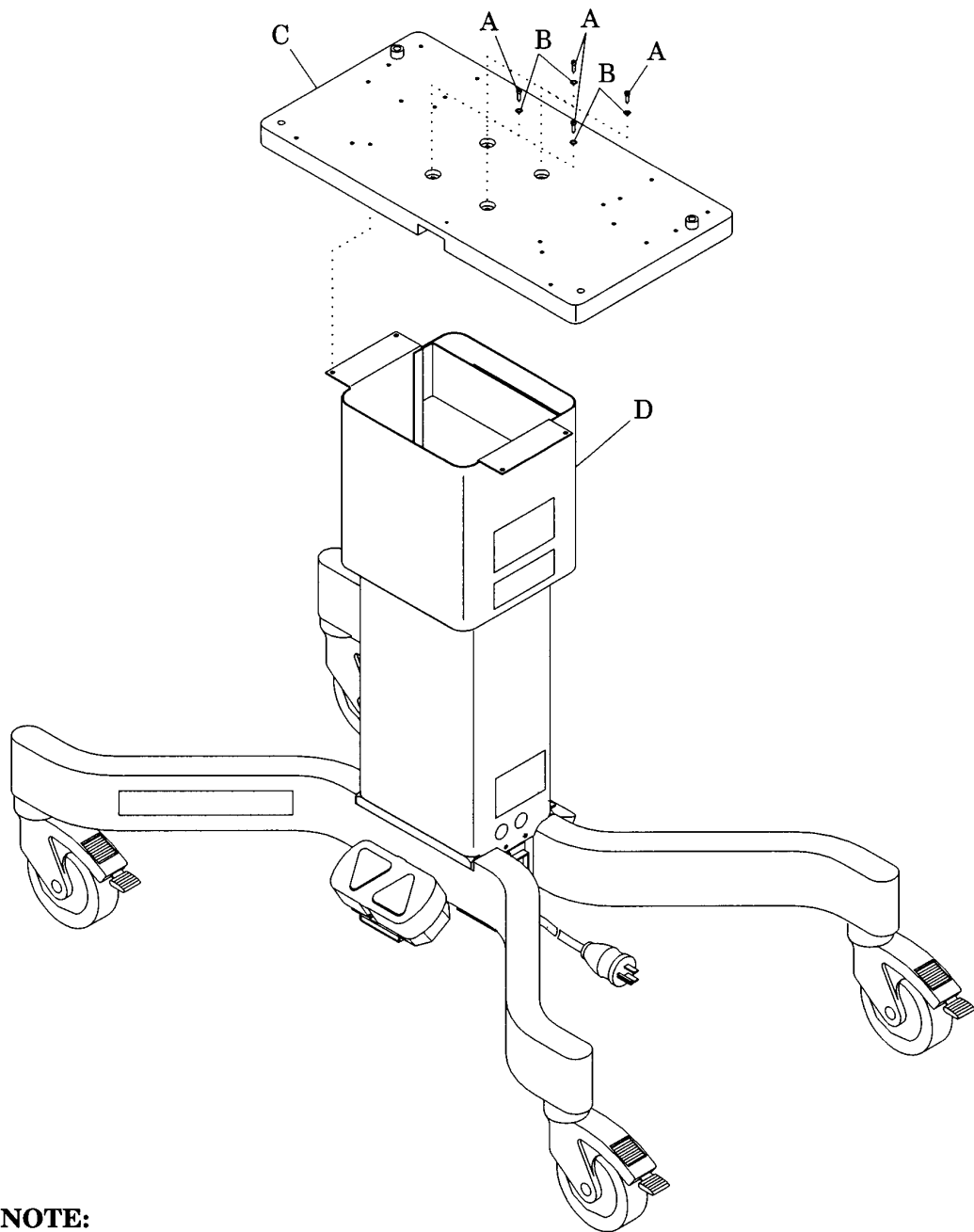
Replacement

NOTE:

The upper transition plate has **two** sets of mounting holes: One set is for the Series 00 model fixed height pedestal stand, the other is for the Series 01 model fixed height pedestal stand and all variable-height adjustable stands.

1. Perform the removal procedure in reverse order.
2. To ensure proper operation of the Isolette® Infant Incubator, perform the "Function Checks" on page 2-6.

Figure 4-51. Upper Transition Plate



NOTE:
Variable-height adjustable stand shown.

m223g167



4.35 Upper Transition Plate

Chapter 4: Removal, Replacement, and Adjustment Procedures

Chapter 5

Parts List

Chapter Contents

Service Parts Ordering	5 - 7
Recommended Spare Parts	5 - 10
Incubator Hood and Shell Assembly	5 - 12
High Dual Access Hood Assembly with Left & Right Iris Ports (P/N 83 200 77-R)	5 - 16
High Front Access Hood Assembly with Two Access Doors and Left & Right Iris Ports (P/N 83 200 71-R) (Series 00 Model)	5 - 20
High Front Access Hood Assembly with Two Access Doors and Left & Right Iris Ports (P/N 83 200 78) (Series 01 Model)	5 - 24
High Dual Access Hood Assembly with One Access Door and One Iris Port (Series 00 Model)	5 - 28
High Dual Access Hood Assembly with Left Iris Port and Right Access Door (P/N 83 200 79) (Series 01 Model Only)	5 - 32
High Dual Access Hood Assembly with Left & Right Access Doors (P/N 83 200 73) (Series 00 Model Only)	5 - 36
High Dual Access Hood Assembly with Left & Right Access Doors (P/N 83 200 80-R) (Series 01 Model Only)	5 - 40
High Front Access Hood Assembly with Left & Right Access Doors (P/N 83 200 74) (Series 00 Model Only)	5 - 44
High Front Access Hood Assembly with Left & Right Access Doors (P/N 83 200 81) (Series 01 Model Only)	5 - 48

High Front Access Panel Assembly (P/N 83 300 70-R) (Series 00 Model Only).	5 - 52
Replacement High Front Access Panel Assembly (P/N 83 300 76-R) (Series 01 Model Only).	5 - 56
High Rear Access Panel Assembly (P/N 83 300 71-R) (Series 00 Model Only).	5 - 60
Replacement High Rear Access Panel Assembly (P/N 83 300 77-R) (Series 01 Model Only).	5 - 64
Shell Assembly (Series 00, 01, and 02 Models Only)	5 - 68
Top Shell Assembly and Barn Door Shell Assembly (Series 00, 01, and 02 Model Only)	5 - 72
Shell Assembly (Series 03 Model Only)	5 - 76
Top Shell Assembly (Series 03 Model Only).	5 - 80
Impeller Movement Detector P.C. Board Assembly	5 - 83
Controller Assembly—Model C2C-2 (P/N 83 006 76)	5 - 84
Controller Enclosure Assembly	5 - 86
Electroluminescent Display Front Panel Assembly	5 - 88
Interface/Power Supply Module.	5 - 89
Sensor Module Assembly.	5 - 90
Fixed-Height Pedestal Stand Assembly (Series 00 Model Only).	5 - 92
Fixed-Height Pedestal Stand Assembly (Series 01 and Higher Models Only)	5 - 96
Variable Height Adjustable Pedestal Stand Assembly.	5 - 100
Hood/Shell Assembly and Pedestal Stand Assembly Attachment	5 - 104
Front and Rear Foot Switch Assemblies.	5 - 106
Check Valve Assembly Replacement Kit (P/N 83 900 16)	5 - 108
Scale Assembly (P/N 83 600 50)	5 - 110
IV Pole Assembly (P/N 83 444 00) (Accessory)	5 - 112
High Monitor Shelf Assembly (P/N 83 442 00) (Accessory).	5 - 114
Swivel Drawer Assembly, Small (P/N 83 441 00) and Large (P/N 83 440 00) (Accessory)	5 - 116
Humidity System Assembly (P/N 83 610 70/80/90) (Accessory)	5 - 120

Humidity System Assembly (P/N 83 613 70/80/81/90) (Accessory)
(Series 02 Model Only). 5 - 124

Evaporator Reservoir Assembly (Accessory) (Series 02 Model Only) 5 - 126

Oxygen System Assembly (P/N 83 620 60 and 83 621 20/21/22)
(Accessory). 5 - 130

Ventilator Tube Support (P/N 83 001 05) (Accessory) 5 - 133

Oxygen Tank Bracket Assembly (P/N 83 443 00) (Accessory). 5 - 134



NOTES:

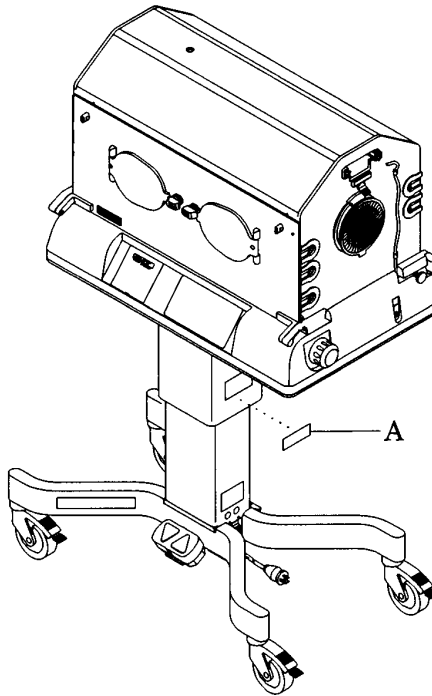
NOTES:

NOTES:

Service Parts Ordering

Using the parts lists in this manual, identify the part number(s) you require. Find the product number and serial number on the product identification label (A) (see figure 5-1 on page 5-7).

Figure 5-1. Product Identification Label Location



m223g088

Call Technical Support at (800) 437-2437 with the following information:

- Customer account number
- Purchase order number
- Product number
- Serial number
- Part number(s)

To promptly order parts, request part prices and availability, or follow up on a service order, use the following fax number:

(215) 675-1859

NOTES:

NOTES:

Recommended Spare Parts

For a recommended spare parts list to service five or more units, see table 5-1 on page 5-10.

Table 5-1. Recommended Spare Parts

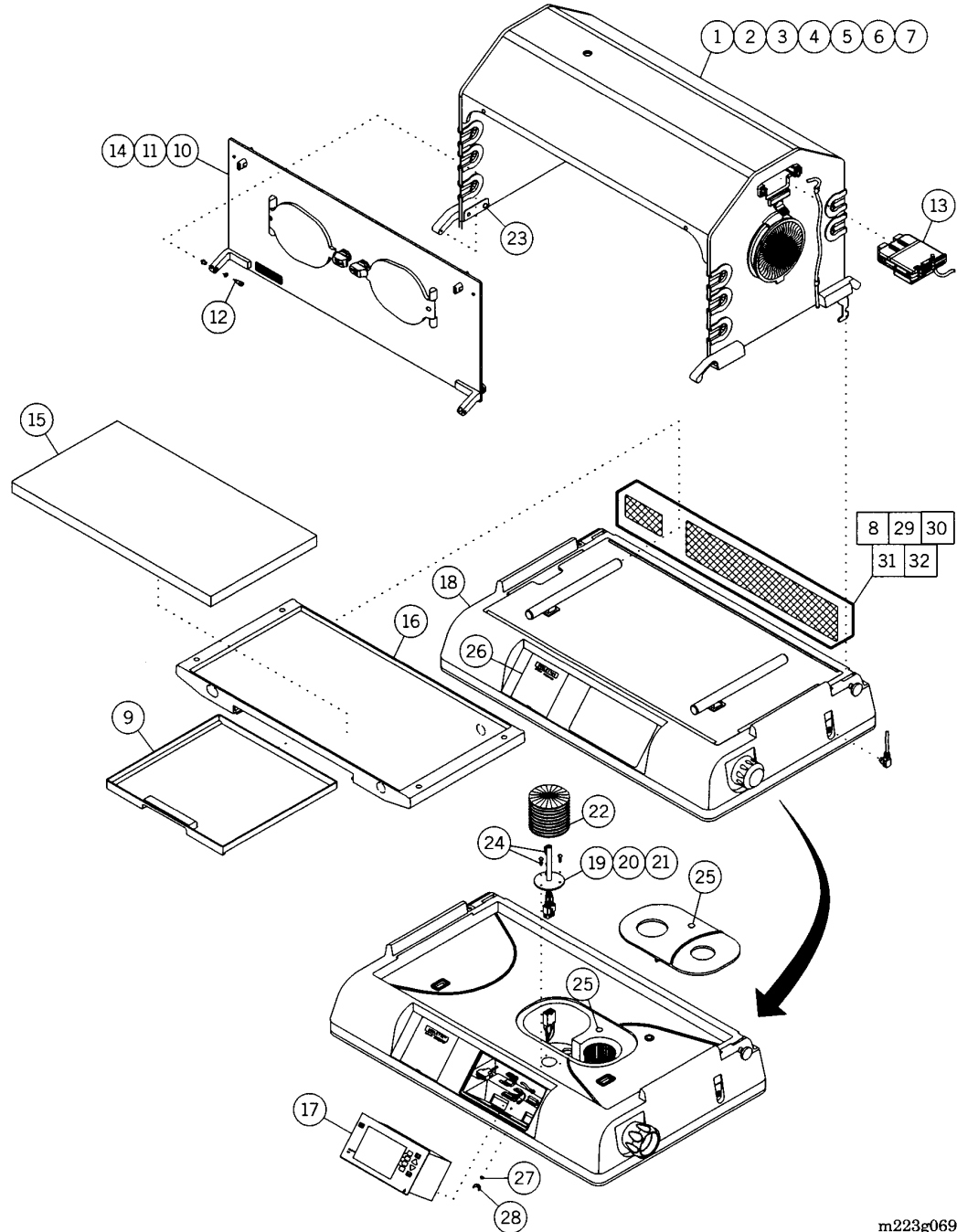
Part Number	Quantity	Description
83 900 15	1	Replacement motor kit, Isolette® Infant Incubator
83 900 09	1	Replacement kit, access door latch
83 300 15	1	Latch mount, access door
83 200 20	1	Grommet, access
83 300 05	1	Door, access
78 293 10	1	Bumper, clear polyurethane, self-adhesive
83 300 08	1	Pivot hinge, access door
68 510 10	1	Spring, torsion, 0.27" outside diameter, 0.03" wide, 0.365" long
83 300 09	1	Latch, heat shield
83 300 07	1	Gasket, access door
83 005 48	1	Sensor module assembly
83 102 85	1	Impeller assembly
83 300 25	1	Upper body, access panel latch
83 300 26	1	Lower body, access panel latch
83 900 08	1	Replacement kit, access panel latch
83 300 29	1	Spring, compression, 0.18" outside diameter, 0.014" wide, 1½" long
83 900 69	1	Paint, touch-up, putty, ¼-pint can
83 600 50	1	Scale assembly, Isolette® Infant Incubator
83 102 10	1	Probe 4, baby temperature, reusable, Isolette® Infant Incubator
83 101 30	1	Filter, replaceable, pack of four, Isolette® Infant Incubator
68 120 71	1	Iris port cuffs, disposable, soft, 100
83 300 11	1	Access door cuff, disposable, replacement, carton of 100

Part Number	Quantity	Description
83 900 11	1	Lift bar kit, Isolette® Infant Incubator
83 900 12	1	Replacement kit, scroll cover, Isolette® Infant Incubator
83 102 18	1	Probe 4, skin temperature, disposable, box of 10, CE, 48" long
83 300 40	1	Cuff, access door, reusable, carton of 10, Isolette® Infant Incubator
83 001 00	1	Mattress, foam
81 502 02	1	Washer, sealing, oxygen/air
68 209 46	1	Critter Covers® Probe Covers, box of 100
68 209 45	1	Critter Covers® Probe Covers, carton of 600
79 251 74	1	Kleenaseptic® B, trigger-spray, twelve, each 24 oz
68 209 47	1	Cover, probe, Care-For-Me, large, 100
68 209 48	1	Cover, probe, Care-For-Me, standard, 100
83 102 21	1	Probe 4, skin temperature, disposable, box of 10, CE, Isolette® Infant Incubator
83 102 05	1	Adapter cable, probe 4, baby temperature
83 900 14	1	Access panel gauge
83 901 22	1	Kit, software distribution assembly

a. Kleenaseptic® is a registered trademark of Predicted Environments, Inc.

Incubator Hood and Shell Assembly

Figure 5-2. Incubator Hood and Shell Assembly



m223g069

Table 5-33. IV Pole Assembly (P/N 83 444 00) (Accessory)

Item Number	Part Number	Quantity	Description
1	83 442 01	1	Support arm, monitor/IV pole
2	83 444 04	1	Adapter, IV pole base
3	83 444 05	1	Base, IV pole
4	26 821 00	1	Nut, locking, 7/8"-20, special fabrication
5	26 822 00	1	Cross arm (IV)
6	99 064 50	1	Screw, 5/16"-18 x 3/4", cap, hex, steel, zinc-plated
7	99 126 32	2	Washer, lock, split, 5/6", steel, cadmium-plated
8	99 901 31	As required	Loctite® adhesive #271-05 (0.50 cc tube)
9	99 044 66	2	Screw, #10-32 x 1 3/4", cap, hex, stainless steel, Nylok® ^b
10	83 444 10	1	Upper extension, IV pole, 11.38" long
11	99 123 94	2	Washer, lock, external, #10, stainless steel
12	83 500 03	1	Label, weight limit, 11 lb
13	99 900 69	As required	Lubricant, Dow Corning® ^c #111
14	99 064 93	1	Screw, 5/16"-18 x 1.38", cap, hex, steel, zinc-plated

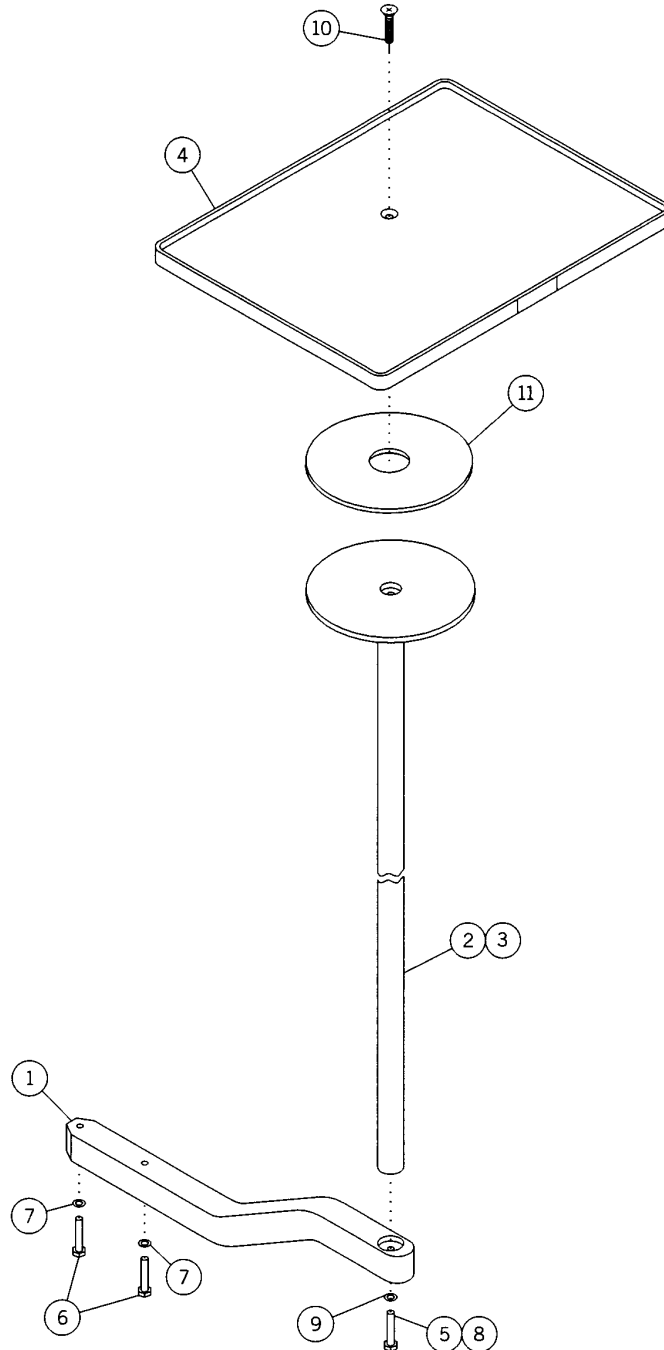
a. Loctite® is a registered trademark of Loctite Corporation.

b. Nylok® is a registered trademark of Nylok Fastener Corporation.

c. Dow Corning® is a registered trademark of Dow Corning Corporation.

High Monitor Shelf Assembly (P/N 83 442 00) (Accessory)

Figure 5-34. High Monitor Shelf Assembly (P/N 83 442 00) (Accessory)



m223g048

Table 5-34. High Monitor Shelf Assembly (P/N 83 442 00) (Accessory)

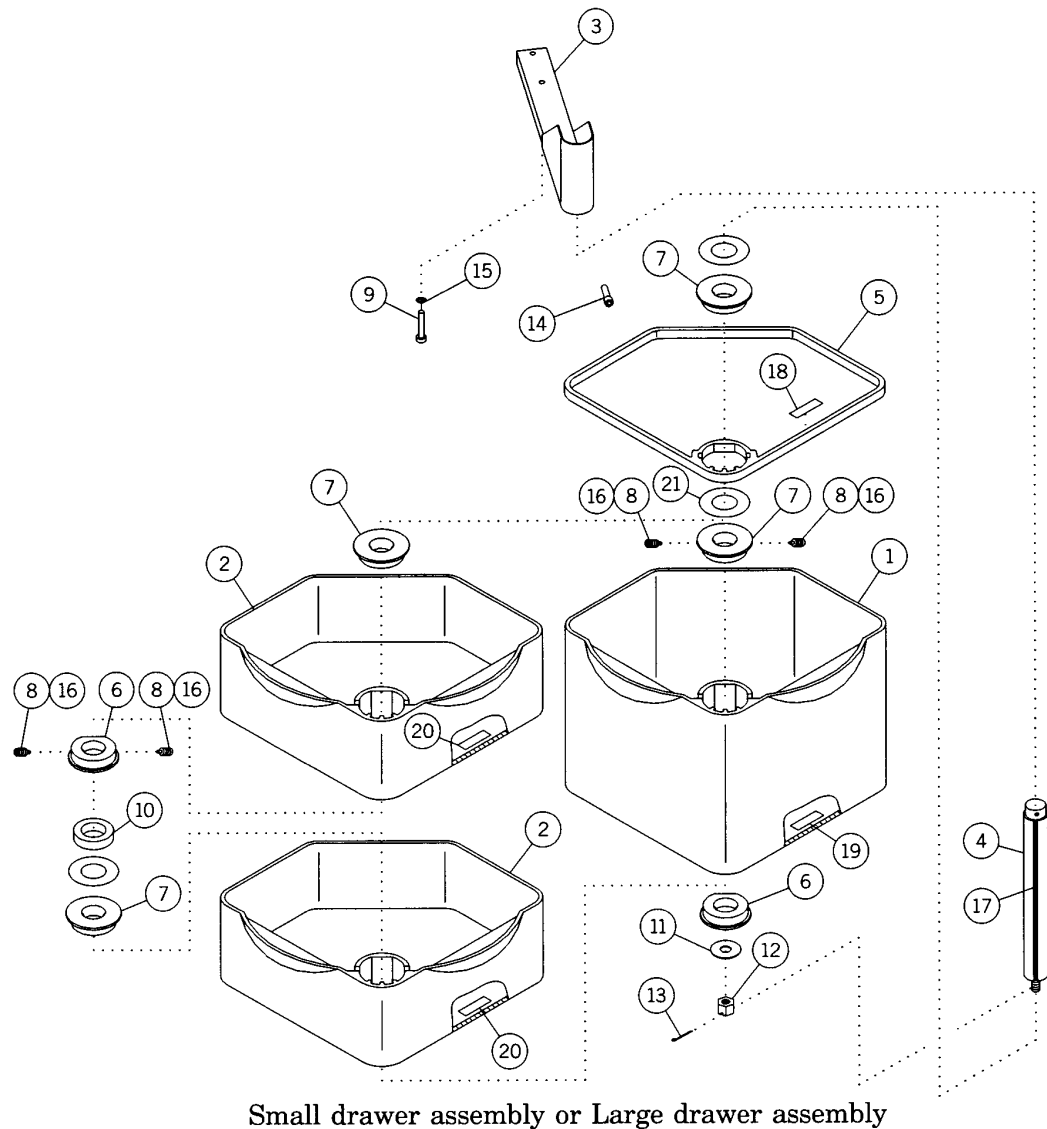
Item Number	Part Number	Quantity	Description
1	83 442 01	1	Support arm, monitor/IV pole
2	83 442 04	1	Pole, monitor shelf, 26.32"
3	83 442 05	1	Pole, monitor shelf, 8.63"
4	83 442 20	1	Monitor shelf subassembly, Isolette® Infant Incubator
5	99 901 31	As required	Loctite® ^a adhesive #271-05 (0.50 cc tube)
6	99 044 66	2	Screw, #10-32 x 1¾", cap, hex, stainless steel, Nylok® ^b
7	99 123 94	2	Washer, lock, external, #10, stainless steel
8	99 064 93	1	Screw, 5/16"-18 x 1.38", cap, hex, steel, zinc-plated
9	99 126 32	1	Washer, lock, split, 5/16", steel, cadmium-plated
10	99 059 43	1	Screw, ¼"-20 x 2.00", flat, phillips, stainless steel, Nylok®
11	83 442 21	1	Washer, 6.5" x ¾" x 0.09", polyurethane

a. Loctite® is a registered trademark of Loctite Corporation.

b. Nylok® is a registered trademark of Nylok Fastener Corporation.

Swivel Drawer Assembly, Small (P/N 83 441 00) and Large (P/N 83 440 00) (Accessory)

Figure 5-35. Swivel Drawer Assembly, Small (P/N 83 441 00) and Large (P/N 83 440 00) (Accessory)



m223g082

Table 5-35. Swivel Drawer Assembly, Small (P/N 83 441 00) and Large (P/N 83 440 00) (Accessory)

Item Number	Part Number	Quantity	Description
1	83 440 01	1	Swivel drawer, large (for use with large swivel drawer assembly only)
2	83 441 01	2	Swivel drawer, small (for use with small swivel drawer assembly only)
3	83 440 06	1	Support arm, swivel drawers
4	83 440 05	1	Shaft, swivel drawers
5	83 440 02	1	Tray writing surface
6	83 440 08	1 or 2	Ring, bottom, swivel drawers
7	83 440 07	2 or 3	Ring, top, swivel drawers
8	83 440 09	6 or 10	Spring plunger, 3/8"-16
9	99 057 32	2	Screw, 1/4"-20 x 7/8", cap, socket, stainless steel, Nylok®
10	83 440 03	1	Spacer, 1 1/4" inside diameter, 2.00" outside diameter, 0.49" thick, acrylonitrile butadiene styrene (ABS) (for use with small swivel drawer assembly only)
11	99 127 78	1	Washer, flat, 0.536" inside diameter, 1 1/2" outside diameter, 0.05" thick, stainless steel
12	99 113 66	1	Nut, hex, castle, 1/2"-20, stainless steel, 0.56" thick
13	99 141 71	1	Pin, cotter, 0.060" diameter, 1.00" long, stainless steel
14	99 055 06	1	Screw, 1/4"-20 x 3/8", cap, socket, stainless steel, Nylok®
15	99 125 71	2	Washer, lock, external, 1/4", stainless steel
16	99 901 38	As required	Loctite® ^b screwlock #222
17	99 900 69	As required	Lubricant, Dow Corning® ^c #111
18	83 500 60	1	Label, load limit, 2 lb/0.91 kg

a. Nylok® is a registered trademark of Nylok Fastener Corporation.

b. Loctite® is a registered trademark of Loctite Corporation.

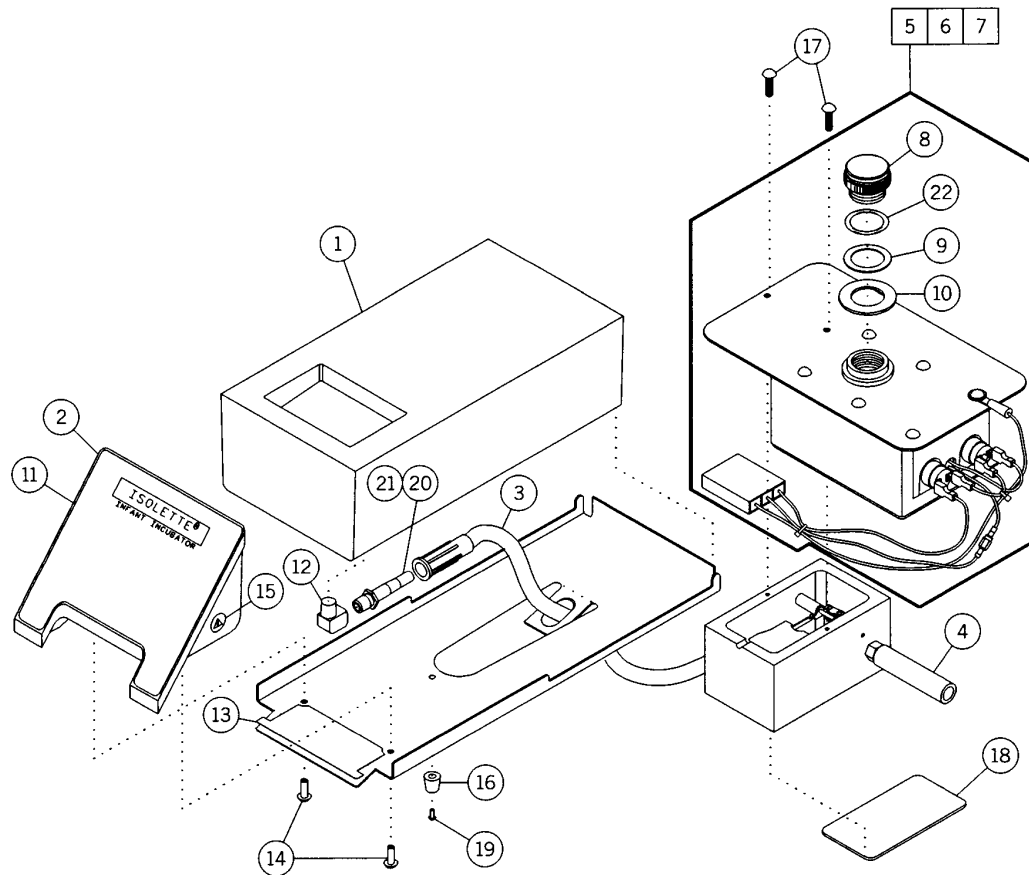
c. Dow Corning® is a registered trademark of Dow Corning Corporation.

Item Number	Part Number	Quantity	Description
19	83 500 62	1	Label, load limit, 10 lb/4½ kg (for use with large swivel drawer assembly only)
20	83 500 61	2	Label, load limit, 5 lb/2.2 kg (for use with small swivel drawer assembly only)
21	83 440 04	2 or 3	Washer, 1¼" inside diameter, 2½" outside diameter, 0.15 thick

NOTES:

Humidity System Assembly (P/N 83 610 70/80/90) (Accessory)

Figure 5-36. Humidity System Assembly (P/N 83 610 70/80/90) (Accessory)



m223g080

**Table 5-36. Humidity System Assembly (P/N 83 610 70/80/90)
(Accessory)**

Item Number	Part Number	Quantity	Description
1	83 900 10	1	Replacement kit, humidity reservoir
2	83 610 03	1	Door, humidity
3	83 612 04	1	Tubing, with ends, ¼" inside diameter, 24.00" long
4	83 611 70-R	1	Replacement housing/float assembly
5	83 612 50-R	1	Evaporator reservoir assembly, 120V (for use with 120V model only)
6	83 612 51	1	Evaporator reservoir assembly, 240V (for use with 240V model only)
7	83 612 52	1	Evaporator reservoir assembly, 100V (for use with 100V model only)
8	83 612 37	1	Cap, evaporator
9	83 610 17	1	Washer, flat, 1.29" outside diameter, 0.88" inside diameter, 0.015" thick, stainless steel
10	83 610 18	1	Washer, flat, 2.0" outside diameter, 0.99" inside diameter, 0.06", polypropylene
11	83 500 06	1	Overlay, humidity drawer, English/Spanish/French/German/Italian
12	83 612 03	1	Elbow, street, 1/8" National Pipe Thread (NPT), brass, nickel-plated
13	83 610 04	1	Trim, humidity tray
14	99 023 03	2	Screw, #6-32 x 5/16", truss, phillips, stainless steel, Nylok® ^a
15	83 500 34	2	Label, manual reference symbol
16	26 605 00	1	Bumper, rubber, recessed (with washer)
17	99 023 05	2	Screw, #6-32 x 5/16", pan, phillips, stainless steel, sems external
18	83 995 06	1	Model/series number log, humidity system, C2000
19	99 010 67	1	Screw, #4-40 x ¼", truss, phillips, stainless steel, Nylok®

a. Nylok® is a registered trademark of Nylok Fastener Corporation.

Item Number	Part Number	Quantity	Description
20	83 612 02	1	Connector, 1/8" NPT, male—1/4" hose, brass, nickel-plated
21	99 901 23	As required	Pipe sealant with Teflon® ^a (Loctite® ^b adhesive #592)
22	99 160 32	1	O-ring, 0.208" x 0.348" x 0.70"

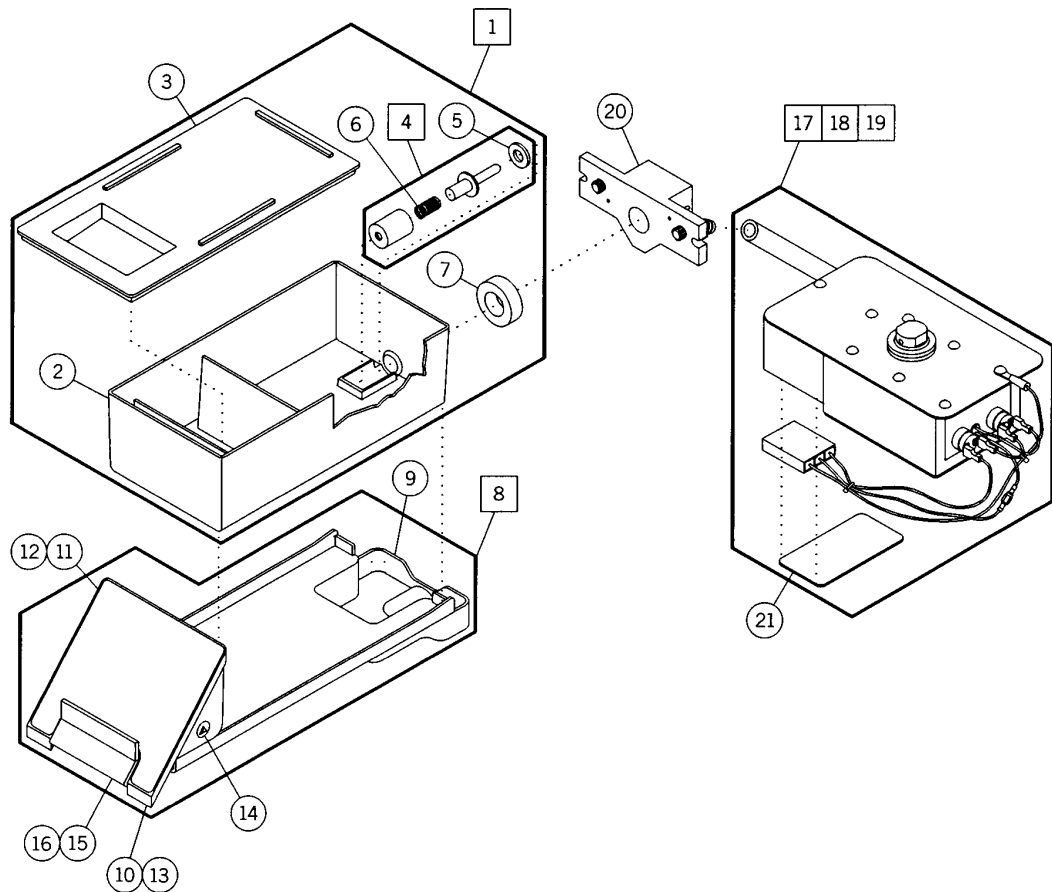
a. Teflon® is a registered trademark of E. I. du Pont and de Nemours and Company.

b. Loctite® is a registered trademark of Loctite Corporation.

NOTES:

Humidity System Assembly (P/N 83 613 70/80/81/90) (Accessory) (Series 02 Model Only)

Figure 5-37. Humidity System Assembly (P/N 83 613 70/80/81/90) (Accessory)
(Series 02 Model Only)



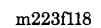
m223g078

**Table 5-37. Humidity System Assembly (P/N 83 613 70/80/81/90)
(Accessory) (Series 02 Model Only)**

Item Number	Part Number	Quantity	Description
1	83 613 65-R	1	Reservoir assembly, humidity
2	83 613 01	1	Reservoir, humidity
3	83 613 00	1	Cover, humidity reservoir
4	83 900 58	1	Replacement kit, seals and springs
5	83 613 06	1	Seal, silicone sponge, ¾" outside diameter
6	83 613 10	1	Spring, compression, 0.360", 0.035" wide, 0.812" long
7	83 613 21	1	Seal, silicone sponge, 1.380" outside diameter
8	83 613 68-R	1	Tray assembly, humidity, English/Spanish/French/German/Italian
9	83 613 02	1	Tray, humidity reservoir
10	83 613 13	1	Door, humidity
11	83 500 06	1	Overlay, humidity drawer, English/Spanish/French/German/Italian
12	83 500 09	1	Overlay, humidity drawer, Swedish/Greek
13	99 023 46	2	Screw, #6-32 x 3/8", flat, phillips, stainless steel, Nylok® ^a
14	83 500 34	2	Label, manual reference symbol
15	83 613 23	1	Handle, humidity
16	83 613 24	1	Pin, 3/32" diameter, 2.968" long, stainless steel
17	83 613 55	1	Replacement kit, evaporator reservoir, 120V (for use with 120V model only)
18	83 613 56	1	Replacement kit, evaporator reservoir, 240V (for use with 240V model only)
19	83 613 57	1	Replacement kit, evaporator reservoir, 100V (for use with 100V model only)
20	83 613 60-R	1	Manifold assembly, humidity
21	81 001 01	1	Label, data tag, 1.63" x 3.00"

a. Nylok® is a registered trademark of Nylok Fastener Corporation.

Figure 5-38. Evaporator Reservoir Assembly (Accessory) (Series 02 Model Only)



**Table 5-38. Evaporator Reservoir Assembly (Accessory)
(Series 02 Model Only)**

Item Number	Part Number	Quantity	Description
1	83 613 25	1	Reservoir, evaporator
2	83 612 35	1	Heater, cartridge, 120V, 100W
3	83 613 27	1	Plate, mounting, evaporator and float housing
4	83 612 47	1	Cap, evaporator, stainless steel
5	83 612 39	1	Plate, mounting, insulation
6	83 613 32	1	Insulation, evaporator reservoir
7	83 613 40	1	Washer, flat, 2.00" outside diameter, 0.06" thick, polypropylene
8	83 612 42	1	Thermostat, automatic, 125°C open/75°C closed
9	83 612 43	1	Thermostat, manual reset limiter (150°C)
10	83 612 38	1	Elbow, 3/8" barb, 1/4" National Pipe Thread (NPT), male, brass
11	83 613 28	1	Gasket, evaporator reservoir
12	99 122 20	1	Washer, lock, external, #6, stainless steel
13	83 612 30	1	Cable assembly, humidity heater to AC
14	99 022 17	1	Screw, #6-32 x 1/8", sems external, socket, stainless steel, cap
15	99 023 03	4	Screw, #6-32 x 5/16", truss, phillips, stainless steel, Nylok® ^a
16	83 613 33	1	Washer, flat, 1.38" outside diameter x 0.88" inside diameter x 0.12" thick, silicone
17	83 610 17	1	Washer, flat, 1.29" outside diameter, 0.88" inside diameter, 0.15" thick, stainless steel
18	99 901 23	As required	Pipe sealant with Teflon® ^b (Loctite® ^c adhesive #592)
19	99 901 98	As required	Sealant, pneumatic/hydraulic, Loctite® #54505

a. Nylok® is a registered trademark of Nylok Fastener Corporation.

b. Teflon® is a registered trademark of E. I. du Pont and de Nemours and Company.

c. Loctite® is a registered trademark of Loctite Corporation.

Item Number	Part Number	Quantity	Description
20	99 901 38	As required	Loctite®* screwlock #222
21	83 611 71-R	1	Replacement housing/float assembly
22	99 023 31	8	Screw, #6-32 x 3/8", truss, phillips, stainless steel

a. Loctite® is a registered trademark of Loctite Corporation.

NOTES:

Oxygen System Assembly (P/N 83 620 60 and 83 621 20/21/22) (Accessory)

Figure 5-39. Oxygen System Assembly (P/N 83 620 60 and 83 621 20/21/22)
(Accessory)

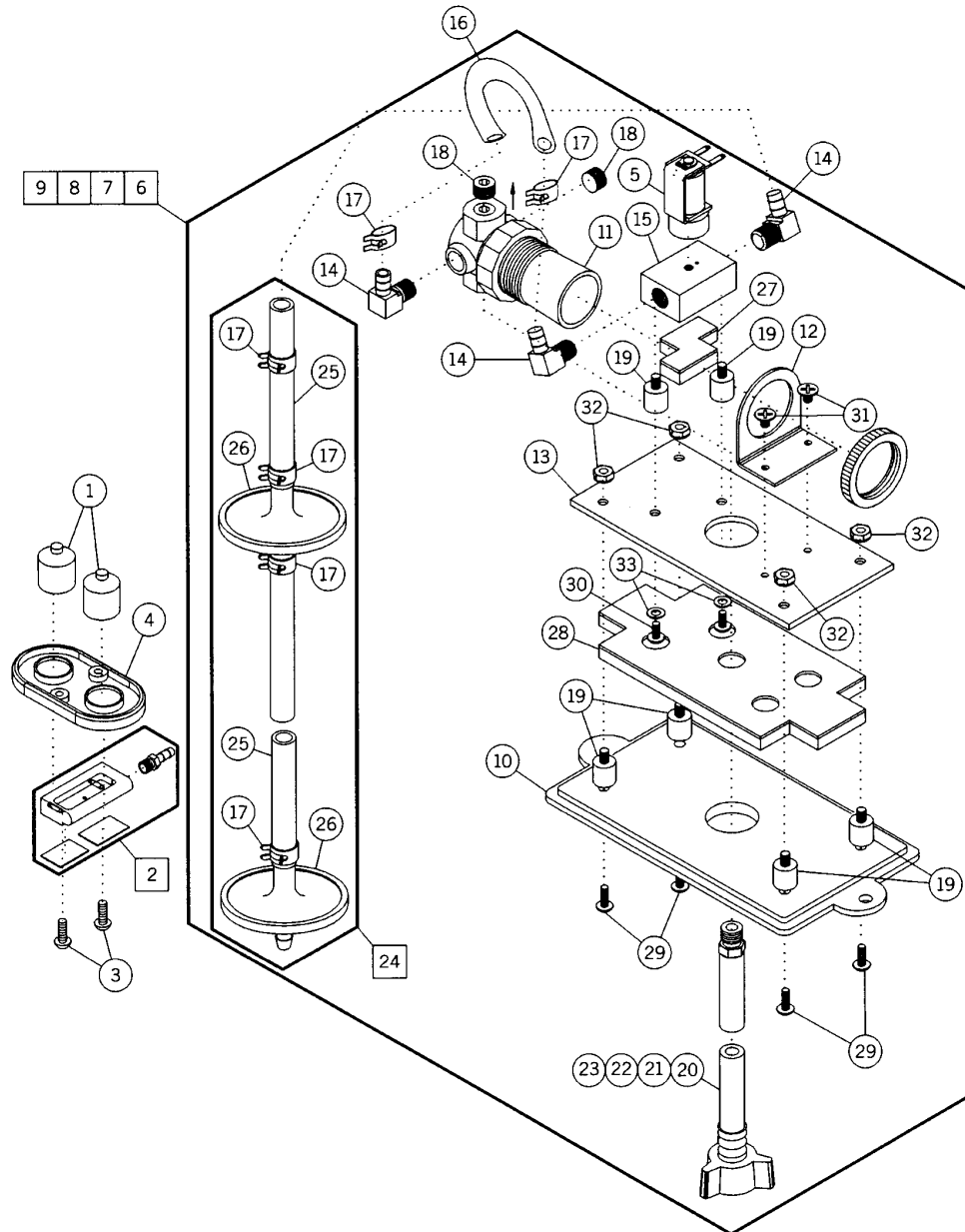


Table 5-39. Oxygen System Assembly (P/N 83 620 60 and 83 621 20/21/22) (Accessory)

Item Number	Part Number	Quantity	Description
1	83 620 30	2	Cell, oxygen
2	83 620 71	1	Oxygen calibration fixture assembly, locking
3	99 031 99	2	Screw, #8-32 x ½", truss, phillips, stainless steel, Nylok® ^a
4	83 620 45	1	Plate, oxygen cell mounting
5	17 751 37	1	Valve, solenoid, 12V DC, 70 psi, oxygen
6	83 620 60	1	Oxygen control valve assembly, green, Diameter Indexed Safety System (DISS)
7	83 621 20	1	Oxygen control valve assembly, green
8	83 621 21	1	Oxygen control valve assembly, white
9	83 621 22	1	Oxygen control valve assembly, blue
10	83 100 11	1	Door, access, pneumatic module
11	83 620 61	1	Regulator, pressure, 40 psi
12	83 620 62	1	Bracket, regulator
13	83 620 63	1	Plate, mounting
14	20 102 10	3	Elbow, 90°, ¼" hose, 1/8" National Pipe Thread (NPT) (male)
15	83 620 67	1	Block, solenoid mount
16	83 620 69	6" (15 cm)	Hose, braided, polyvinyl chloride (PVC), clear, ¼" inside diameter
17	83 620 64	6	Clamp, hose, 0.460", 0.545" inside diameter
18	99 900 26	As required	Tape, pipe joint seal, Teflon® ^b , ½"
19	68 230 24	6	Isolator, vibration, 0.44" outside diameter, 0.44" long, 4 lb
20	83 620 40	1	Oxygen hose, green, DISS
21	83 620 41	1	Oxygen hose, green
22	83 620 42	1	Oxygen hose, white
23	83 620 43	1	Oxygen hose, blue

a. Nylok® is a registered trademark of Nylok Fastener Corporation.

b. Teflon® is a registered trademark of E. I. du Pont and de Nemours and Company.

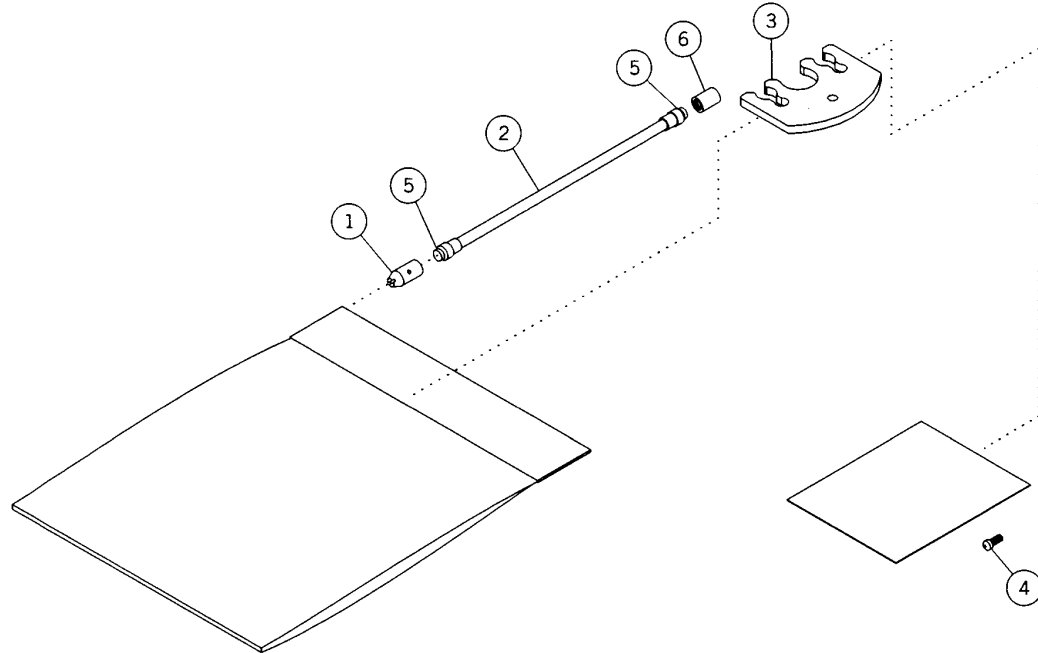
Item Number	Part Number	Quantity	Description
24	83 900 22	1	Retrofit kit, dual filter, oxygen control valve
25	83 612 41	17" (43 cm)	Tubing, 1/4" inside diameter, 7/16" outside diameter, silicone
26	83 620 57	2	Filter, suction, disposable, rectangular
27	83 620 66	1	Sound coat, solenoid mounting block
28	83 620 68	1	Sound coat, mounting plate
29	99 031 52	4	Screw, #8-32 x 3/8", truss, phillips, stainless steel, Nylok® ^a
30	99 031 05	2	Screw, #8-32 x 5/16", truss, phillips, stainless steel
31	99 030 76	2	Screw, #8-32 x 1/4", truss, phillips, stainless steel, Nylok®
32	99 106 32	4	Nut, hex, #8-32, keps, steel, zinc-plated
33	99 122 92	2	Washer, lock, internal, #8, stainless steel
34	83 620 56*	1	Hook, oxygen hose

a. Nylok® is a registered trademark of Nylok Fastener Corporation.

* Item not shown.

Ventilator Tube Support (P/N 83 001 05) (Accessory)

Figure 5-40. Ventilator Tube Support (P/N 83 001 05) (Accessory)



m223g081

Table 5-40. Ventilator Tube Support (P/N 83 001 05) (Accessory)

Item Number	Part Number	Quantity	Description
1	68 200 67	1	Pin, ball detent with slot
2	83 001 06	1	Tubing, flexible
3	68 252 04	1	Tubing, hanger
4	99 031 99	1	Screw, #8-32 x ½", truss, phillips, stainless steel, Nylok®
5	99 901 77	As required	Loctite® adhesive #242
6	68 252 00	1	Ferrule, flexible tubing

a. Nylok® is a registered trademark of Nylok Fastener Corporation.

b. Loctite® is a registered trademark of Loctite Corporation.

Oxygen Tank Bracket Assembly (P/N 83 443 00) (Accessory)

Figure 5-41. Oxygen Tank Bracket Assembly (P/N 83 443 00) (Accessory)

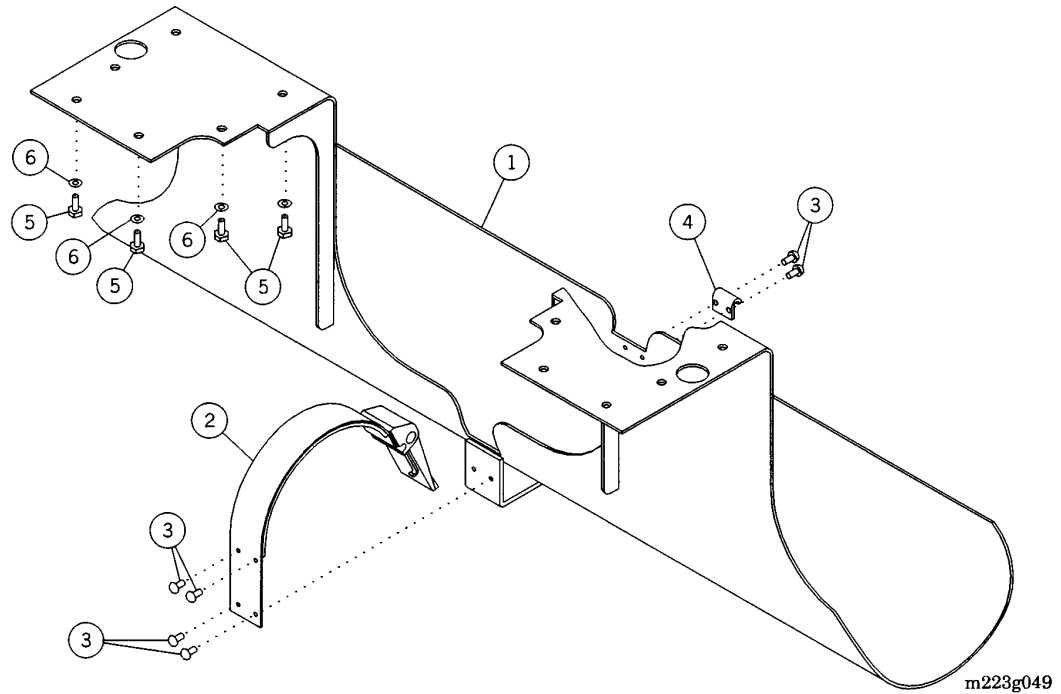


Table 5-41. Oxygen Tank Bracket Assembly (P/N 83 443 00) (Accessory)

Item Number	Part Number	Quantity	Description
1	83 443 03	1	Support, tank, variable height adjustable (VHA)
2	83 443 04	1	Clamp assembly, tank
3	99 022 83	6	Screw, #6-32 x ¼", pan, phillips, stainless steel, sems external
4	24 144 01	1	Hook, latch, modified
5	99 042 03	12	Screw, #10-32 x ½", cap, hex, stainless steel
6	99 123 92	12	Washer, lock, internal, #10, stainless steel

Chapter 6

General Procedures

Chapter Contents

Cleaning	6 - 3
Steam Cleaning	6 - 4
Cleaning Hard to Clean Spots	6 - 4
Disinfecting	6 - 4
Using Cleaning Agents	6 - 4
Skin Temperature Probe	6 - 4
Access Door Gaskets and Tubing Access Ports	6 - 4
Controller, Shell, and Pedestal Stand	6 - 5
Hood, Sensor Module, and Heat Shields	6 - 5
Heater Radiator and Fan Impeller	6 - 6
Mattress Tray, Main Deck, Heater/Impeller Cover, and Mattress Tilt Bars	6 - 7
Air Intake Microfilter	6 - 7
Humidity Reservoir	6 - 7
Component Handling	6 - 8
P.C. Board	6 - 8
Lubrication Requirements	6 - 9
Preventive Maintenance	6 - 10
Preventive Maintenance Schedule	6 - 11
Preventive Maintenance Checklist	6 - 12
Installation and Set-up	6 - 13
Unpacking	6 - 13
Assembling	6 - 13

Setting Up	6 - 15
Oxygen Sensor Calibration	6 - 19
Room Air—21% Oxygen Calibration	6 - 19
100% Oxygen Calibration	6 - 20
Oxygen Concentration Test	6 - 22
Weighing Scale Calibration	6 - 24
Current Leakage Test	6 - 26
Set-Up	6 - 26
Procedure	6 - 26
Disassembly and Assembly for Cleaning	6 - 27
Disassembly	6 - 27
Cleaning	6 - 31
Assembly	6 - 31
Filling the Humidity Reservoir	6 - 33
Updating the Software	6 - 34
Procedure	6 - 34
Installing the VueLink™ Software Monitor Connection	6 - 36
Tool and Supply Requirements	6 - 37

Cleaning



WARNING:

Follow the product manufacturer's instructions. Failure to do so could result in personal injury or equipment damage.



WARNING:

Make sure that the oxygen supply to the incubator is turned off and that the incubator is disconnected from the oxygen supply when performing cleaning procedures. A fire and explosion hazard exists when cleaning in an oxygen-enriched environment.



SHOCK HAZARD:

Unplug the unit from its power source. Failure to do so could result in personal injury or equipment damage.



SHOCK HAZARD:

Do not expose the unit to excessive moisture. Personal injury or equipment damage could occur.



CAUTION:

Do not use harsh cleansers, such as scouring pads or heavy-duty grease removers or solvents, such as acetone. Equipment damage could occur.

If there is no visible soilage with possible body fluids, we recommend that you clean the unit with a mild detergent and warm water. If disinfection is desired, you may use a combination cleanser/disinfectant as explained in "Disinfecting" on page 6-4.

At a minimum, thoroughly clean and disinfect the incubator upon discharge of an infant. However, depending on individual facility policy, perform this as often as daily, if desired. The most effective way to clean is to first disassemble, and then group the parts and/or assemblies in categories according to the method of cleaning required.

Steam Cleaning

Do not use any steam cleaning device on the unit. Excessive moisture can damage mechanisms in this unit.

Cleaning Hard to Clean Spots

To remove difficult spots or stains, we recommend that you use standard household cleansers and a soft-bristled brush. To loosen heavy, dried-on soil, you may first need to saturate the spot.

Disinfecting

When there is visible soilage and between patients, we recommend that you disinfect the unit with a tuberculocidal disinfectant. (For customers in the US, the disinfectant should be registered with the Environmental Protection Agency.)

Dilute and use the disinfectant according to the manufacturer's instructions.

Do not spray the disinfectant onto power cord terminals or control switches.

Using Cleaning Agents

Use a tuberculocidal cleanser/disinfectant registered by the US Environmental Protection Agency (EPA) (US only), but only after the incubator is empty and disassembled (see "Disassembly and Assembly for Cleaning" on page 6-27). After removing all solid wastes and contaminants from the disassembled parts, clean them as follows:

Skin Temperature Probe

Using an appropriate cleanser/disinfectant, thoroughly clean the skin temperature probe, and then wipe with a clean cloth or paper towel.

Access Door Gaskets and Tubing Access Ports

Using an appropriate cleanser/disinfectant, thoroughly clean all surfaces, and then wipe with a clean cloth or paper towel.

Controller, Shell, and Pedestal Stand



CAUTION:

Some chemical cleaning agents may be conductive and/or leave a residue that may enable a build-up of conductive dust or dirt. Do **not** permit cleaning agents to contact electrical components. Do **not** spray cleaning solutions onto any of these surfaces.

Use an EPA-registered cleanser/disinfectant to clean all surfaces thoroughly; then dry with a clean cloth or paper towel.



CAUTION:

When cleaning the interior of the incubator shell, prevent liquids from entering the motor shaft opening. Equipment damage could occur.

In addition, check for fluids that may have dripped onto the bottom surface of the humidity tray opening. If fluids are present, use a clean paper towel dampened with a cleanser/disinfectant to wipe the surface dry.

Hood, Sensor Module, and Heat Shields



CAUTION:

Alcohol can cause crazing of the clear acrylic hood. Do not use alcohol for cleaning.



CAUTION:

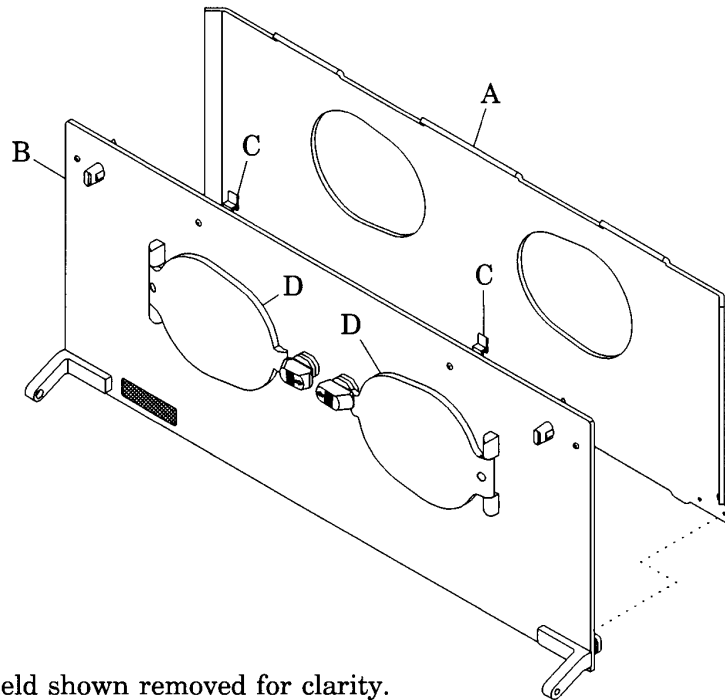
Do not expose the hood assembly to direct radiation from germicidal lamps. Ultraviolet radiation from these sources can cause cracking of gaskets, fading of paint, and crazing of the clear acrylic hood.

NOTE:

The heat shields are hinged on the access panels or the rear wall of the incubator.

Release the heat shield (A) from the access panel (B) or the rear wall by pressing on the latches (C) located along its top (see figure 6-1 on page 6-6).

Figure 6-1. Releasing the Inner Wall



NOTE:
Heat shield shown removed for clarity.

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Using an appropriate cleanser/disinfectant, thoroughly clean all surfaces of the hood, including the sensor module, the heat shields (A), and the access doors (D). Clean all holes and indentations, and then dry with a clean cloth or paper towel.

Heater Radiator and Fan Impeller



WARNING:

Failure to clean the heater radiator and fan impeller could result in sufficient lint build-up to reduce airflow, which will affect temperature control and cause high oxygen concentrations. Infant injury could occur.

Remove any lint build-up on the heater radiator and fan impeller.

Mattress Tray, Main Deck, Heater/Impeller Cover, and Mattress Tilt Bars

Using an appropriate cleanser/disinfectant, thoroughly clean all surfaces, and then dry with a clean cloth or paper towel.

Air Intake Microfilter



WARNING:

A dirty air intake microfilter may affect oxygen concentrations and/or cause carbon dioxide build-up. Check the filter routinely, and change it at least every 3 months or when it is visibly dirty. Failure to do so could result in infant injury.

NOTE:

If the incubator is used in an unusually dusty environment, more frequent replacement of the microfilter may be necessary.

Do **not** attempt to clean or reverse the microfilter. If the air intake microfilter is visibly dirty or older than 3 months, replace it (refer to procedure 4.19 on page 4-49). Before installing a new filter, clean the microfilter chamber and its cover with a cleanser/disinfectant.

Humidity Reservoir

To clean the humidity reservoir using an appropriate cleanser/disinfectant, perform the following:

1. Place the humidity reservoir and its lid in an suitable container filled with an appropriate cleanser/disinfectant.
2. Allow the humidity reservoir and its lid to soak as recommended by the cleaning solution's manufacturer.
3. Remove the humidity reservoir and its lid from the cleanser/disinfectant, and rinse them with sterile water.
4. Allow the humidity reservoir and its lid to dry.

NOTE:

Sterilization of the humidity reservoir is generally **not** considered necessary and may reduce the useful life of the humidity reservoir. However, if desired, the humidity reservoir withstands steam under pressure.

Component Handling



CAUTION:

To prevent component damage, ensure that your hands are clean, and **only** handle the P.C. board by its edges.



CAUTION:

When handling electronic components, wear an antistatic strap. Failure to do so could result in component damage.



CAUTION:

For shipping and storage, place the removed P.C. board in an antistatic protective bag. Failure to do so could result in equipment damage.

P.C. Board

When servicing the P.C. board, follow good handling practices. Mishandling a P.C. board can cause the following:

- P.C. board damage
- Shortened P.C. board life
- Unit malfunctions

Observe the following P.C. board handling rules:

- Ensure that hands are clean and free of moisture, oily liquids, etc.
- **Only** handle the P.C. board by its outer edges.
- Do not touch the P.C. board components. Finger contact with the board surface and/or with its components can leave a deposit that will result in board (and component) deterioration.
- When working with electronics, wear an appropriate antistatic strap, and ensure that it is properly grounded.
- Service the removed P.C. board at a static-free workstation that is properly grounded.
- For shipping and storage, place the removed P.C. board in an antistatic protective bag.

Lubrication Requirements



WARNING:

Follow the product manufacturer's instructions. Failure to do so could result in personal injury or equipment damage.



CAUTION:

Do not use silicone-based lubricants. Equipment damage could occur.

Oilite®¹ bearings and bushings are utilized in several places on the system. By retaining oil, the pores give a self-lubricating quality to the bearings and bushings. If any silicone-based lubricant is applied to the bearings and bushings or anywhere else on the system, this self-lubricating quality is neutralized.

It is safe to apply the following lubricants to the system (see table 6-1 on page 6-9):

Table 6-1. Lubricants

Part Number	Description
8252 (100)	2 oz m-1 oil (apply to Oilite® bearings and bushings)
SA3351 (100)	4 oz lithium grease

1. Oilite® is a registered trademark of Beemer Precision, Incorporated.

Preventive Maintenance



WARNING:

Only facility-authorized personnel should perform preventive maintenance on the Isolette® Infant Incubator. Preventive maintenance performed by unauthorized personnel could result in personal injury or equipment damage.



WARNING:

Make sure that the oxygen supply to the incubator is turned off and that the incubator is disconnected from the oxygen supply when performing maintenance procedures. A fire and explosion hazard exists when performing maintenance procedures in an oxygen-enriched environment.

The Isolette® Infant Incubator requires an effective maintenance program. We recommend that you perform annual preventive maintenance (PM) and testing for Joint Commission on Accreditation of Healthcare Organizations (JCAHO) to help ensure a long, operative life for the Isolette® Infant Incubator. PM will minimize downtime due to excessive wear.

The following PM process guides you through a normal PM procedure on the Isolette® Infant Incubator. During this PM process, check each item on the schedule, and make the necessary adjustments.

Follow the PM schedule with the corresponding PM checklist. This checklist is designed to keep a running maintenance history and subsequent repair costs for one Isolette® Infant Incubator. However, your facility can modify this checklist or design another to fit your needs. Two effective ways to reduce downtime and ensure the patient remains comfortable are keeping close records and maintaining the Isolette® Infant Incubator.

Preventive Maintenance Schedule

Table 6-2. Preventive Maintenance Schedule

Function	Procedure
Overall performance	To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.
Patient compartment	Inspect the patient compartment for signs of breakage. Replace assemblies as necessary before placing the incubator into service.
Oxygen sensor cells	Replace both oxygen sensor cells annually (refer to procedure 4.3 on page 4-8).
Current leakage	Perform the leakage current test (refer to procedure 6.5 on page 6-26)

Preventive Maintenance Checklist

Table 6-3. Preventive Maintenance Checklist

Date																					Function
Manufacturer																					Overall performance
																					Patient compartment
																					Oxygen sensor cells
																					Current leakage
Model Number																					
Serial Number																					
Total Cost for this Page																					Labor Time:
																					Repair Cost:
																					Inspected by:
																					Legend
																					L=Lube
																					C=Clean
																					A=Adjust
																					R=Repair or
																					Replace
																					O=Okay
																					N=Not
																					Applicable
																					Remarks:

6.1 Installation and Set-up

Tools required: 7/16" socket wrench

Unpacking

NOTE:

Typically, the fixed-height pedestal stand or the optional variable height adjustable (VHA) pedestal stand and the hood/shell assembly ship in separate cartons.



CAUTION:

When removing the equipment from the cartons, take care not to scratch or otherwise damage unprotected surfaces.

1. When removing the equipment from the cartons, take care not to scratch or otherwise damage unprotected surfaces.
2. Remove all packing materials from the hood/shell assembly (A) (see figure 6-2 on page 6-14).

Assembling

NOTE:

The hood/shell and the pedestal stand are keyed such that the hood/shell can mount on the pedestal **only** when the hood/shell power cord receptacle is located on the same side as the line cord coming out of the pedestal/stand.

1. Position the hood/shell assembly (A) on the pedestal stand (B) so that its power cord receptacle is on the same side as the adapter power cord (C) of the pedestal stand (B).



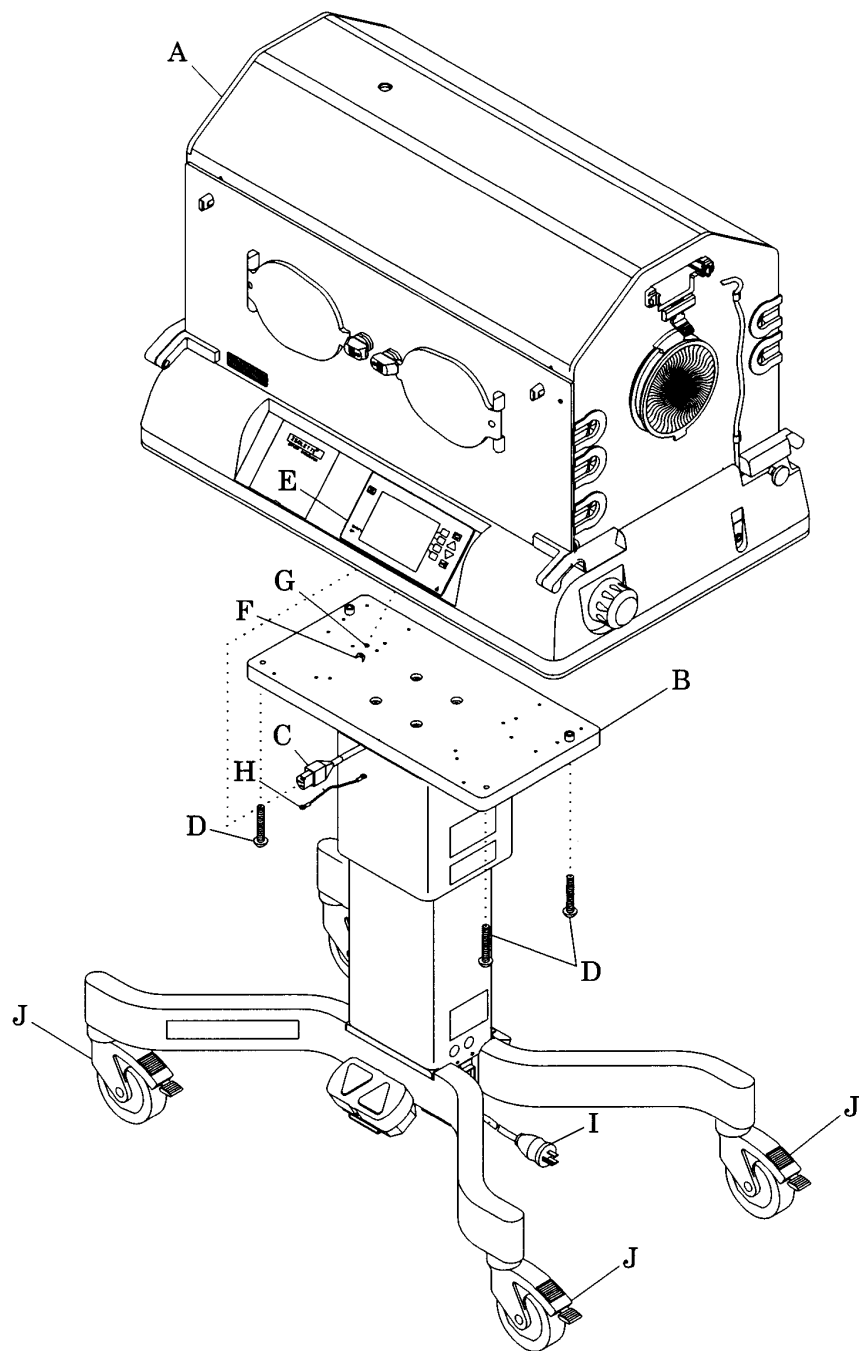
WARNING:

The hood/shell assembly **must** attach to the pedestal/stand using the screws provided. Failure to do so could result in the hood/shell assembly separating from the pedestal stand when sufficiently tilted, particularly with the hood open. Personal injury or equipment damage could occur.

2. Install the four 1/4"-20 x 1 3/4" Nylok®¹ screws (D) to secure the hood/shell assembly (A) on the pedestal stand (B).

1. Nylok® is a registered trademark of Nylok Fastener Corporation.

Figure 6-2. Assembling the Hood/Shell on the Pedestal/Stand



m223g075

3. Plug the adapter power cord (C) into the power cord receptacle beneath the controller (E) on the hood/shell assembly (A).
4. Remove the wing nut (F) and flatwasher (G) from the stud next to the power cord receptacle.
5. Place the ring lug of the controller's ground lead (H) on the stud.
6. Replace the wing nut (F) and flatwasher (G).
7. Plug the power cord (I) into an appropriate power source.



WARNING:

To keep the incubator from sliding when parked on an incline, face the pedestal stand front locking casters down the incline and locked.

8. If the unit is parked on an incline, face the pedestal/stand's front locking casters (J) down the incline, and lock them in position.

Setting Up

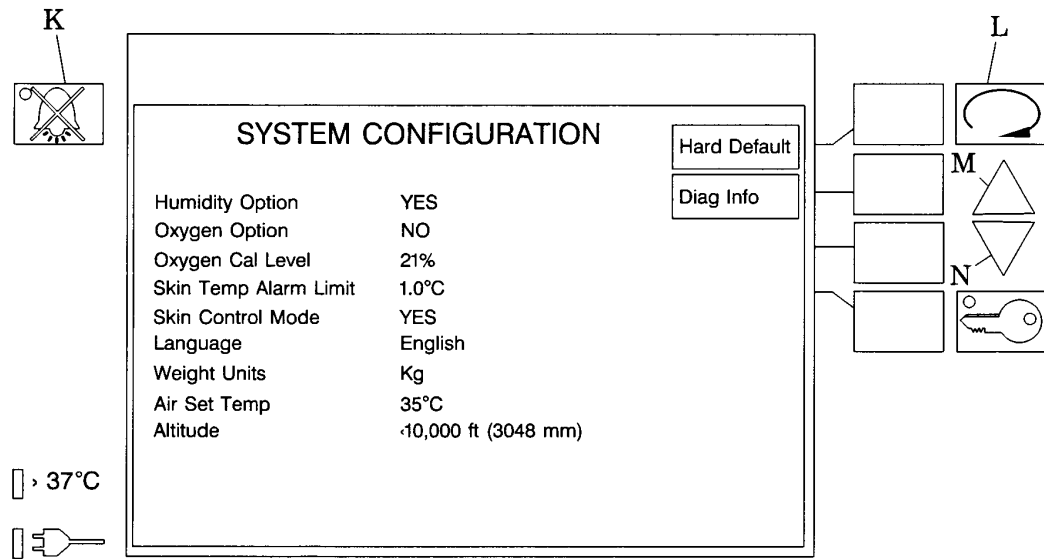
NOTE:

The **System Configuration** menu activates or deactivates the humidity system, oxygen system, and Skin Mode. The **Skin Temperature** alarm limit may be set to either $\pm 0.5^{\circ}\text{C}$ or $\pm 1^{\circ}\text{C}$, and the oxygen calibration level may be set to either 100% or 21%.

Perform the following to enter the **System Configuration** menu:

1. Turn the controller (E) off.
2. Press and hold the **Silence/Reset** key (K) (see figure 6-3 on page 6-16) while simultaneously turning on the **Power** switch on the controller (E) (see figure 6-2 on page 6-14).

Figure 6-3. System Configuration Menu



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NOTE:

The controller can select the following languages: English, French, German, Spanish, Italian, Flemish, Dutch, Norwegian, Danish, Japanese, Polish, Finnish, Portuguese, Swedish, and Greek.

3. Press the **Display Selection** key (L) to highlight the desired option, parameter, or mode of operation (see table 6-4 on page 6-17) (see figure 6-3 on page 6-16).

Table 6-4. Set-up Options, Parameters, and Modes

Display Selection key selections	Up Arrow key selections	Down Arrow key selections
Humidity option	Yes	No
Oxygen option	Yes	No
Oxygen calibration level	100%	21%
Skin temperature alarm limit	1.0°C	0.5°C
Skin Mode	Yes	No
Language	English	Italian
	French	Spanish
	German	German
	Spanish	French
	Italian	English
Weight unit	lb	kg
Air set temperature	30°C to 37°C	37°C to 30°C
Altitude	< 10000' (3048 m)	> 10000' (3048 m)

4. Press the Up arrow key (M) to scroll to a language, raise the air set temperature, or select the following:
 - **YES** (activate)
 - **100%**
 - **1.0°C**
 - **lb** (pounds)
5. Press the Down arrow key (N) to scroll to a language, lower the air set temperature, or select the following:
 - **NO** (deactivate)
 - **21%**
 - **0.5°C**
 - **kg** (kilograms)
6. To exit, press the **Silence/Reset** key (K).

7. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

6.2 Oxygen Sensor Calibration

Tools required: None

If the message **Cal Required** appears, perform this procedure to calibrate the oxygen control system. Daily calibrations are recommended. To maintain system accuracy, a seven-day calibration cycle is required.

Room Air—21% Oxygen Calibration

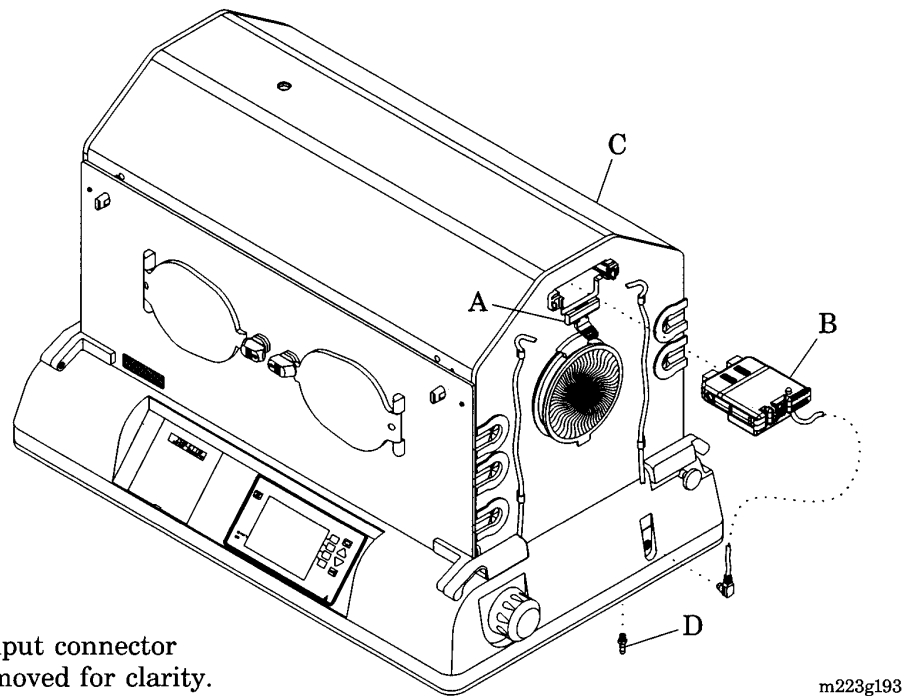


WARNING:

For the 21% oxygen calibration, the unit **must** be equipped with a standard sensor module lock. Failure to use a standard sensor module could result in incorrect calibration. Infant injury could occur.

1. Ensure that the unit is equipped with a standard sensor module lock (A) (see figure 6-4 on page 6-19).

Figure 6-4. Sensor Module Assembly



NOTE:

Oxygen input connector
shown removed for clarity.

2. On Display 1, perform the following:
 - a. Press the **Oxygen** key.

- b. Press the **On** key.
- c. Press the **Cal** softkey.

NOTE:

To prevent a **Cal Fail** message, withdraw the sensor module from the hood within 5 seconds of pressing the **Cal** Softkey.

3. Within 5 seconds, perform the following:
 - a. Pull down on the sensor module lock (A).
 - b. Withdraw the sensor module assembly (B) from the hood assembly (C) until it stops.
4. Allow the calibration to complete. Perform one of the following:
 - If the message **Cal Pass** appears in the **Oxygen** display, go to step 5.
 - If the message **Cal Fail** appears, go to step 1, and repeat the procedure.
 - If the message **Cal Fail** appears and the calibration procedure is unsuccessful a second time, call Technical Support at (800) 437-2437 for assistance.
5. Slide the sensor module assembly (B) into the hood assembly (C), and push up on the sensor module lock (A).
6. Press the **On** softkey.
7. To ensure proper operation of the Isolette® Infant Incubator, perform the "Function Checks" on page 2-6.

100% Oxygen Calibration



WARNING:

For the 100% oxygen calibration procedure, the incubator hood **must** be equipped with the 100% calibration fixture. Failure to use the 100% calibration fixture could result in incorrect calibration. Infant injury could occur.

1. Ensure that the incubator hood is equipped with the 100% calibration fixture.
2. Connect an oxygen hose to a 100% medical grade oxygen source at 3 lpm to 5 lpm and to the barbed oxygen input connector (D).

3. Turn on the oxygen.
4. On Display 1, perform the following:
 - a. Press the **Oxygen** key.
 - b. Press the **On** key.
 - c. Press the **Cal** softkey.

NOTE:

To prevent a **Cal Fail** message, withdraw the sensor module from the hood within 5 seconds of pressing the **Cal** softkey.

5. Within 5 seconds, perform the following:
 - a. Pull down on the sensor module lock (A).
 - b. Withdraw the sensor module assembly (B) from the hood assembly (C) until it stops.
6. Allow the calibration to complete. Perform one of the following:
 - If the message **Cal Pass** appears in the **Oxygen** display, go to step 7.
 - If the message **Cal Fail** appears, go to step 1, and repeat the procedure.
 - If the message **Cal Fail** appears and the calibration procedure is unsuccessful a second time, call Technical Support at (800) 437-2437 for assistance.
7. Slide the sensor module assembly (B) into the hood assembly (C), and push up on the sensor module lock (A).
8. Press the **On** softkey.
9. To ensure proper operation of the Isolette® Infant Incubator, perform the "Function Checks" on page 2-6.

6.3 Oxygen Concentration Test

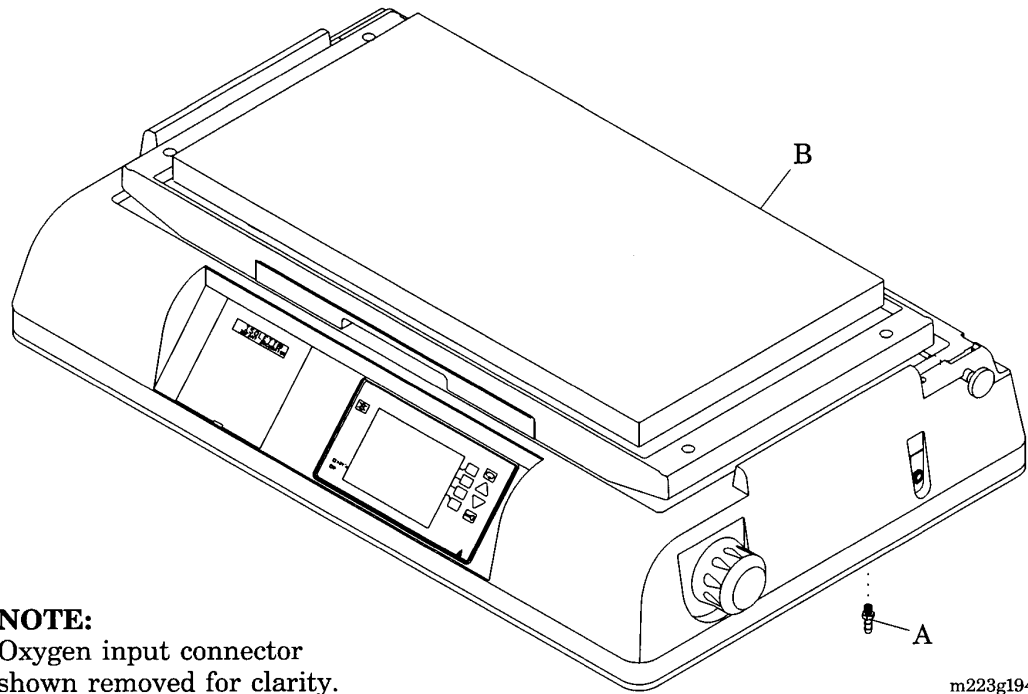
Tools required: Calibrated oxygen analyzer
 Oxygen flowmeter
 3/16" inner diameter surgical tubing

NOTE:

This test only applies to units that are **not** equipped with an oxygen servo-control system.

1. Using 3/16" inner diameter surgical tubing, connect the output of the oxygen flowmeter to the nipple of the oxygen input connector (A) (see figure 6-5 on page 6-22).

Figure 6-5. Oxygen Concentration Test



NOTE:

Oxygen input connector shown removed for clarity.

2. Allow the oxygen concentrations to stabilize.
3. Place a calibrated oxygen analyzer on the center of the mattress (B).



WARNING:

Oxygen flow rates cannot be used as an accurate indication of oxygen concentration in an incubator. Continuously monitor the oxygen concentrations with a calibrated oxygen analyzer. Failure to do so could result in personal injury or equipment damage.

NOTE:

An oxygen concentration guide is provided in table 6-5 on page 6-23. This guide also appears on the back of the incubator.

4. Apply oxygen at the flow rates described in the oxygen concentration guide (see table 6-5 on page 6-23).

Table 6-5. Oxygen Concentration Guide

Oxygen Supply	Approximate Oxygen %
3 lpm	30%-45%
6 lpm	40%-60%
9 lpm	45%-75%
12 lpm	50%-85%
15 lpm	60%-90%

5. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

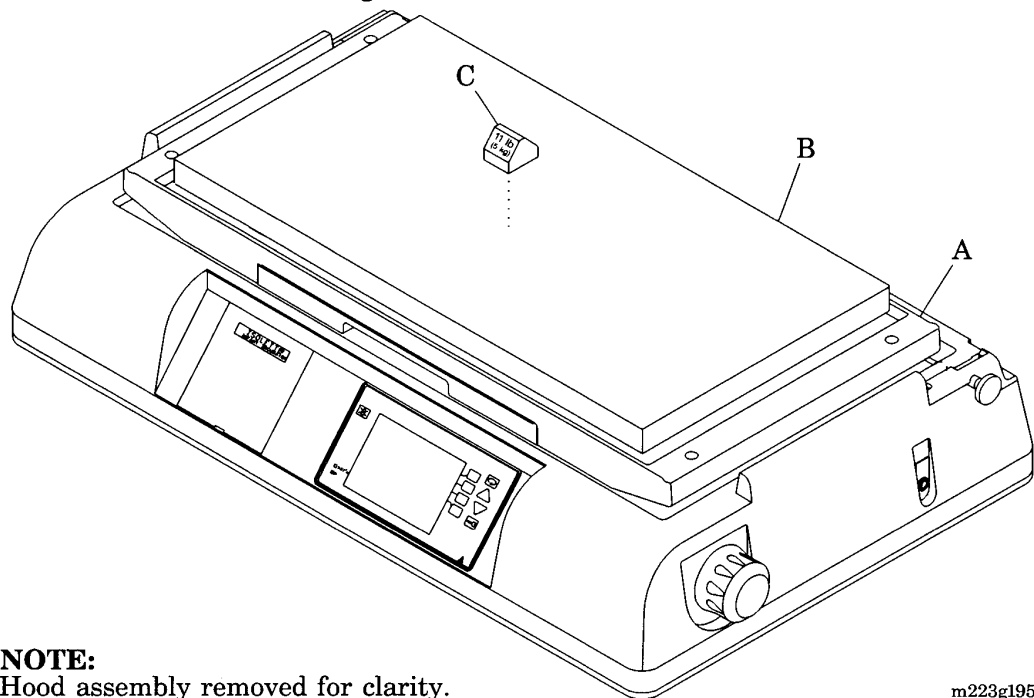
6.4 Weighing Scale Calibration

Tools required: Weight, 11 lb (5 kg) (P/N 03 310 16)

Using a calibrated weigh, perform the following procedure to calibrate the scale upon installation and every 6 months thereafter:

1. Ensure that the mattress tray (A) is level and not in the Trendelenburg or Reverse Trendelenburg position (see figure 6-6 on page 6-24).

Figure 6-6. Scale Calibration



NOTE:
Hood assembly removed for clarity.

2. Select Display 2, and press the **Weigh** softkey.
3. If objects are on the mattress (B), remove them.
4. At Display 2, perform the following:
 - a. Press the **Zero** softkey two times.
 - b. Press the **Cal** softkey.
5. Wait for a weight reading and the **5 kg** symbol to appear.

NOTE:

If a calibrated 11 lb (5 kg) weight is **not** placed on the mattress within 12 seconds after the **5 kg** symbol appears, the **Zeroing Failed** system prompt message appears.

6. Within 12 seconds after the weight reading, place a calibrated 11 lb (5 kg) weight (C) on the mattress (B).
7. Wait for a weight reading. Perform one of the following:
 - If a reading of **5.000 kg** appears, go to step 8.
 - If a reading of **5.000 kg** does **not** appear, go to RAP 2.47 on page 2-114.
8. Remove the weight (C).
9. Press the **Home** softkey.
10. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

6.5 Current Leakage Test

Tools required: Calibrated leakage tester

Set-Up

1. Connect the controller to the primary power source through an ungrounded adapter plug so that the unit is ungrounded.
2. Turn the **Power** switch on.

NOTE:

The current leakage test standards, provided in the test procedures below, assume leakage through a resistance of 1000 ohms.

3. If the leakage tester being used does **not** provide a resistance of 1000 ohms, adjust the test set-up to provide it.
4. Turn the **Power** switch off.

NOTE:

The current leakage test standards, provided in the test procedures below, assume leakage through a resistance of 1000 ohms.

5. If the leakage tester being used does **not** provide a resistance of 1000 ohms, adjust the test set-up to provide it.

Procedure

1. Use the leakage tester to measure between the chassis of the unit and a known ground, such as the ground connection of a wall receptacle.

NOTE:

The leakage current must **not** exceed 300 uA for 100V AC/120V AC units or 500 uA for 220V AC/240V AC units.

2. Reverse the plug, and repeat step 1.
3. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

6.6 Disassembly and Assembly for Cleaning

Tools required: None

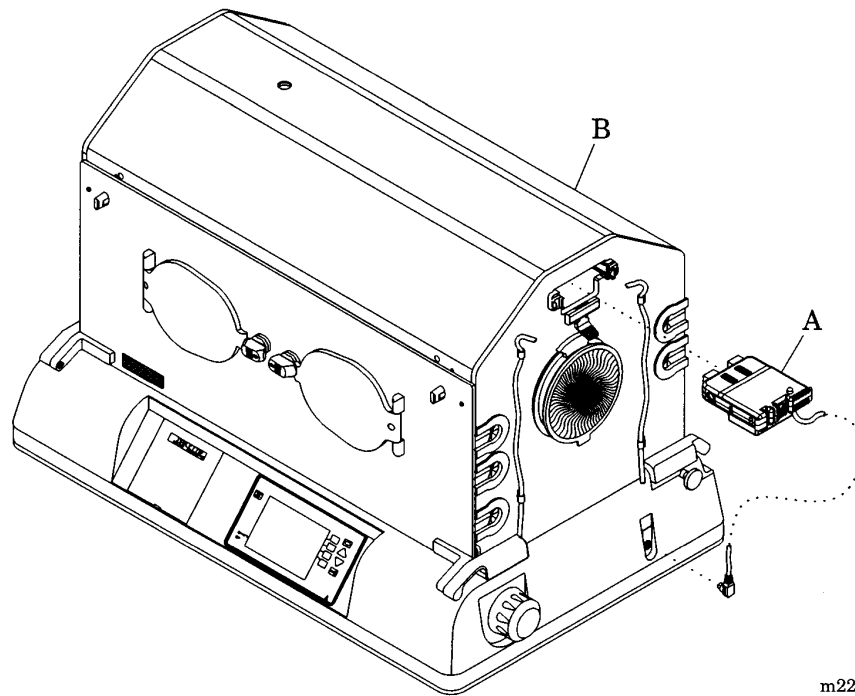
Disassembly

NOTE:

For routine cleaning, do **not** separate the hood/base assembly from the pedestal stand. If separation is necessary, refer to “Installation and Set-up” on page 6-13, and perform the “Assembling” procedure in reverse order.

1. Disconnect the sensor module assembly (A) from the unit (see figure 6-7 on page 6-27).

Figure 6-7. Hood Assembly



m223g196



CAUTION:

Before lifting the incubator hood for cleaning, ensure that all mounted accessories have been removed to prevent possible interference with the raised hood.

2. Remove all mounted accessories from the unit.

3. Slowly tilt the hood assembly (B) back until it is fully open.
4. Slide the x-ray tray (C) out of the mattress tray (D) (see figure 6-8 on page 6-29).
5. If the incubator is equipped with a weighing scale, remove it (refer to procedure 7.1 on page 7-5).
6. Remove the mattress (E) and the mattress tray (D) (refer to procedure 4.7 on page 4-18).
7. Pull the mattress tilt bars (F) up through the main deck (G).
8. Remove the main deck (G).
9. Remove the heater/impeller cover (H).

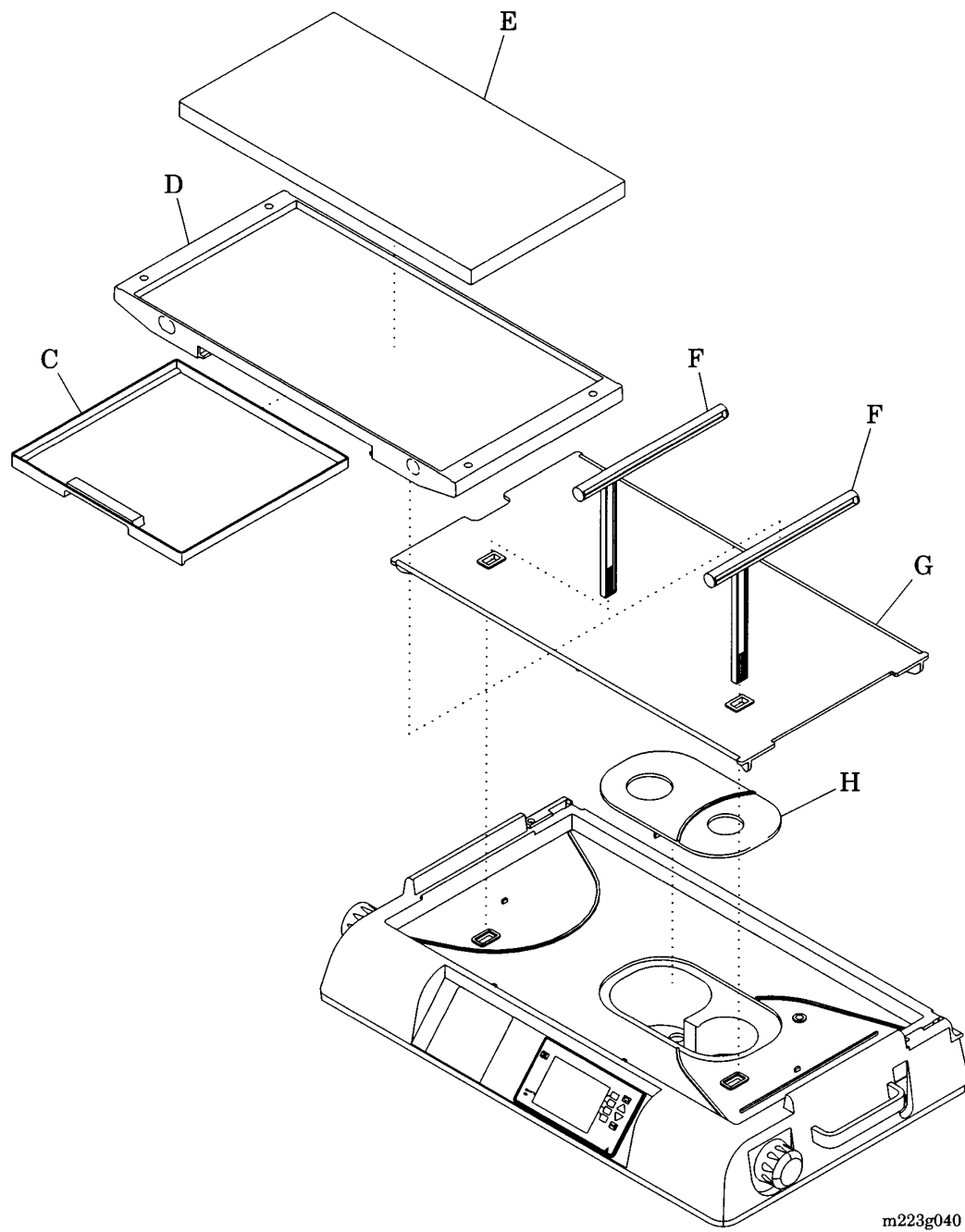


WARNING:

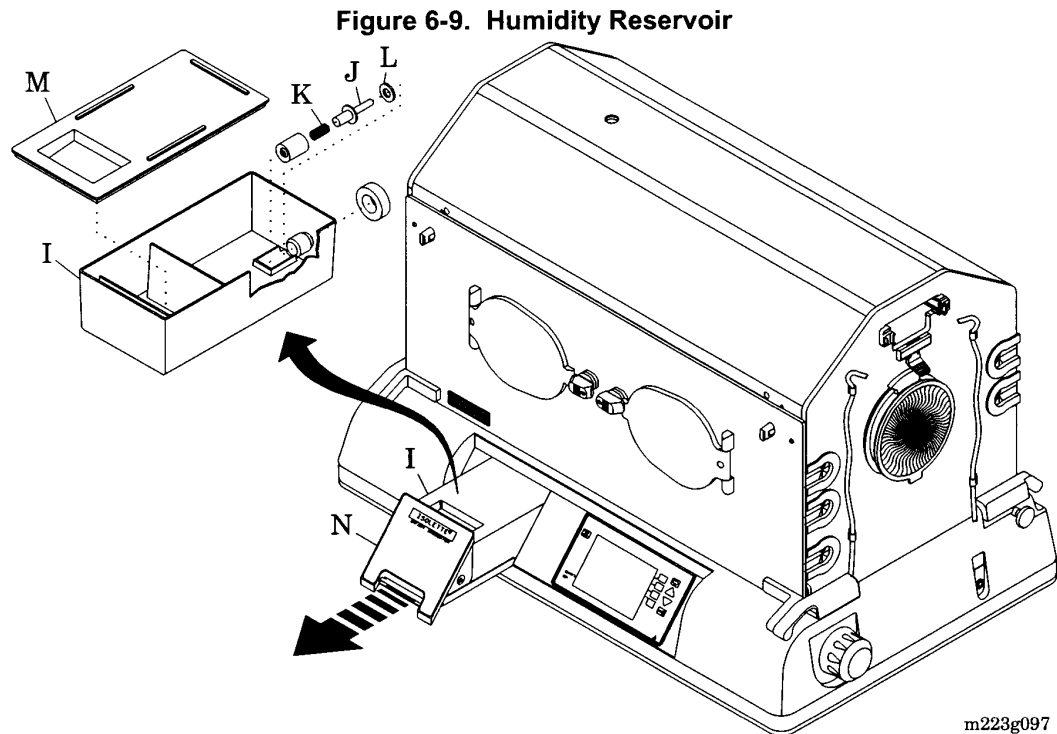
Allow 45 minutes for the heater assembly to cool. Failure to do so could result in personal injury.

10. Switch off the unit, and allow 45 minutes for the heater assembly to cool.
11. Remove the heater radiator and the heater assembly from the unit (refer to procedure 4.20 on page 4-50).
12. Remove the impeller assembly (refer to procedure 4.8 on page 4-20).

Figure 6-8. Mattress Platform Assembly



13. If the unit is equipped with a humidity system, perform the following:
 - a. Remove the humidity reservoir (I) from the unit (refer to procedure 7.3 on page 7-14) (see figure 6-9 on page 6-30):



- b. Remove the reservoir valve (J) by compressing its ends and lifting it up on the rear end.
 - c. Remove the spring (K) and the seal (L) from the reservoir valve (J), and place the spring (K), the seal (L), and the reservoir valve (J) in the humidity reservoir (I).
14. Remove and **discard** the disposable access door cuffs from each access door (refer to procedure 4.26 on page 4-71).
15. Remove the access door gaskets from each access door (refer to procedure 4.27 on page 4-73).
16. Remove the tubing access grommets from each side of the hood assembly (refer to procedure 4.34 on page 4-93).
17. Remove the disposable iris entry port sleeves (refer to procedure 4.11 on page 4-31). Wipe clean.

18. Remove the air intake microfilter cover and the air intake microfilter from the unit (refer to procedure 4.19 on page 4-49).

Cleaning

For details on component cleaning, refer to “Cleaning” on page 6-3.

Assembly

NOTE:

Before assembling cleaned components into the incubator, inspect them for any breakage or cracks. Harsh cleaning agents may harm some of the plastics used in the patient compartment.

1. Install the impeller assembly (refer to procedure 4.8 on page 4-20).
2. Install the heater assembly and the heater radiator (refer to procedure 4.20 on page 4-50)
3. Install the heater/impeller cover (H) (see figure 6-8 on page 6-29).
4. Install the main deck (G).
5. Slide the mattress tilt bars (F) through their openings in the main deck (G).
6. Install the mattress tray (D) and the x-ray tray (C) (refer to procedure 4.7 on page 4-18).
7. If the unit is equipped with a weighing scale, install it (refer to procedure 7.1 on page 7-5).
8. Place a new disposable mattress cover over the mattress (E).
9. Install the mattress (E) on the mattress tray (D).
10. Install disposable iris entry port sleeves (refer to procedure 4.11 on page 4-31).

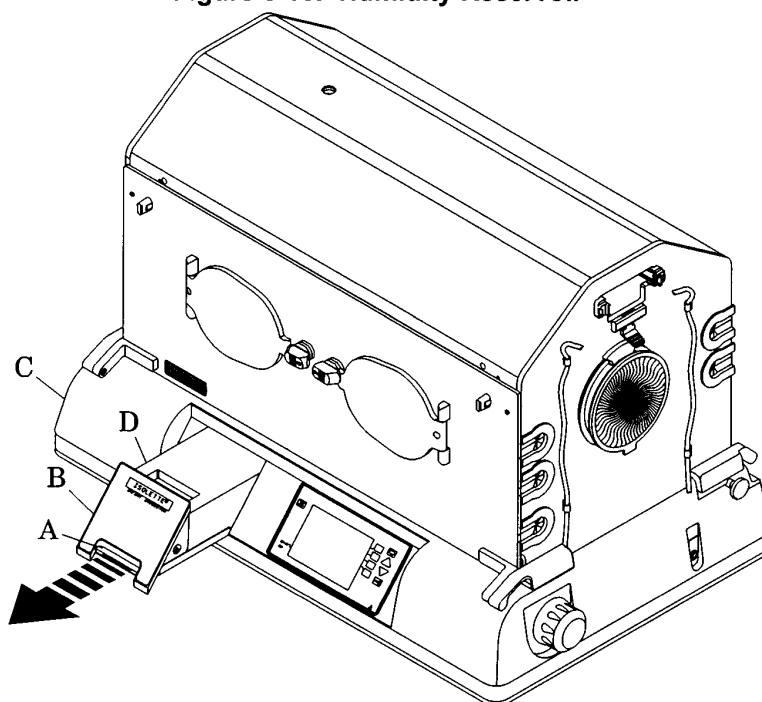
11. If the unit is equipped with a humidity system, perform the following:
 - a. Install the reservoir valve (J), the spring (K), and the seal (L) in the humidity reservoir (I) (see figure 6-9 on page 6-30).
 - b. Install the lid (M) on the humidity reservoir (I).
 - c. Install the humidity reservoir (I) on the humidity tray (N).
 - d. Slide the humidity tray (N) and the humidity reservoir (I) into the unit.
12. Inspect the tubing access grommets, and perform one of the following:
 - If a tubing access grommet is distorted or torn, replace it (refer to procedure 4.34 on page 4-93).
 - If a tubing access grommet is **not** distorted or torn, install it on the hood assembly (refer to procedure 4.34 on page 4-93).
13. Install an access door gasket on each access door (refer to procedure 4.27 on page 4-73).
14. If the incubator is to be gas sterilized, sterilize it.
15. Install a new access door cuff onto each access door gasket (refer to procedure 4.26 on page 4-71).
16. Inspect the air intake microfilter, and perform one of the following:
 - If the air intake microfilter is discolored or dirty, replace it (refer to procedure 4.19 on page 4-49).
 - Install the air intake microfilter and the air intake microfilter cover onto the unit (refer to procedure 4.19 on page 4-49).
17. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

6.7 Filling the Humidity Reservoir

Tools required: Distilled water

1. Release the latch (A) that secures the humidity tray (B) in the shell assembly (C), and withdraw the humidity reservoir (D) until it stops at the fill position (see figure 6-10 on page 6-33).

Figure 6-10. Humidity Reservoir



m223g197



CAUTION:

To avoid equipment damage, use **only** distilled or sterile distilled water. Sterile water alone is **not** an acceptable substitute for distilled water.

2. Fill the humidity reservoir (D) with distilled water.
3. To ensure proper operation of the Isolette® Infant Incubator, perform the "Function Checks" on page 2-6.

6.8 Updating the Software

Tools required: Computer equipped with a CD-ROM drive, an available RS-232 communications port, and Microsoft Windows®¹ 95 or later version operating system

Parts required:

(1)	83 901 22	Software Update Kit includes the following items:
(1)	reference only	Programmed CD-ROM in case
(1)	83 930 70	Cable assembly, programming

Procedure

1. Remove the incubator from service.
2. Install the CD-ROM labeled **Software Update C2000 Isolette® Infant Incubator** into the CD-ROM drive of the computer.
3. Run **setup.exe** to install the program on the computer.
4. Turn the incubator's **Power** switch to the **Off** position.



CAUTION:

Use **only** the programming cable assembly (P/N 83 930 70) to install the software update. Using a standard RS-232 cable assembly could result in equipment damage.

5. Connect the male end of the programming cable assembly to the RS-232 port on the back of the controller.
6. Connect the female end of the programming cable assembly to the RS-232 port of the computer.
7. Turn the incubator's power switch to the **On** position.
8. Run **download.exe**, and follow the displayed directions to install the software upgrade on the computer.
9. Follow the directions displayed on the computer.
10. Retain the programming cable assembly (83 930 70) for future upgrades.

1. Microsoft Windows® is a registered trademark of Microsoft Corporation.

11. Perform the operational check; refer to the Isolette® Infant Incubator User Manual.

12. Return the incubator to service.

NOTE:

Total installation time is approximately 5 minutes per unit.

6.9 Installing the VueLink™¹ Software Monitor Connection

Tools required: Straight-through RS-232 DB-9 male to DB-25 female adapter cable

VueLink™ software enables the user to view patient parameters from the Isolette® Infant Incubator on a bedside patient monitor or a central monitoring system.

Procedure

1. Set the Isolette® Infant Incubator power switch to **Off**.
2. Connect the DB-9 male end of the RS-232 cable into the RS232 port on the bottom of the Isolette® Infant Incubator controller module.
3. Connect the DB-25 female end of the RS-232 cable to the bedside patient monitor or central monitoring system.
4. While pressing the **Silence/Reset** key, set the Isolette® Infant Incubator power switch to **On** to enter the set-up menu.
5. Using the Display selection button, scroll down to the VueLink™ software option.
6. Press the **Up** arrow to select **Yes**.
7. Press the **Silence/Reset** key to exit the set-up menu.
8. On the bedside patient monitor, press the **Module Setup** key. The **Module Setup** window appears on the VueLink™ software screen.
9. Press the gray button beneath the **HRAS C2000** caption. Values for the Isolette® Infant Incubator will appear on the VueLink™ software screen of the bedside patient monitor. Alarm messages resulting from alarm conditions will appear automatically.

NOTE:

VueLink™ system software does not have touch-screen capability.

NOTE:

Values from the bedside patient monitor can be archived using a central monitoring system. For details on this function, contact your local Phillips representative.

1. VueLink™ is a trademark of Phillips Medical Systems.

Tool and Supply Requirements

To service the Isolette® Infant Incubator, the following tools and supplies are required:

- Phillips head screwdriver
- Small screwdriver
- 7/16" socket wrench
- 7/32" socket wrench
- 1/8" hex head wrench
- 9/64" Allen™¹ wrench
- 5 mm hex key **or** 3/16" hex key
- Pliers (two pair)
- Long-nose pliers
- Needle-nose pliers
- Nut driver
- Calibrated oxygen analyzer
- Oxygen flowmeter
- Calibrated leakage tester
- 3/16" inner diameter surgical tubing
- 12" long wooden prop
- Flat padded surface
- Distilled water
- Clean cloth
- Ruler
- Pencil
- Small hack saw
- Emery board
- Computer equipped with a CD-ROM drive, an available RS-232 communications port, and Microsoft Windows®² 95 or later version operating system

1. Allen™ is a trademark of Industrial Fasteners, Inc.

2. Microsoft Windows® is a registered trademark of Microsoft Corporation.

- ¼-pint can of touch-up putty paint (P/N 83 900 69)
- Controller firmware (P/N 83 006 36)
- Programming cable assembly (P/N 83 930 70)
- Access panel gauge (P/N 83 900 14)
- Weight, 11 lb (5 kg) (P/N 03 310 16)
- Straight-through RS-232 DB-9 male to DB-25 female adapter cable

Chapter 7

Accessories

Chapter Contents

Accessories	7 - 3
Weighing Scale	7 - 5
Installation	7 - 5
Removal	7 - 7
Oxygen System	7 - 8
Installation	7 - 8
100% Calibration Fixture Installation	7 - 12
Removal	7 - 13
Humidity System	7 - 14
Preparing the Shell Assembly	7 - 14
Installing the Humidity System (Series 00 and 01 Models)	7 - 16
Installing the Humidity System (Series 02 Models)	7 - 18
Removing the Humidity System	7 - 20

NOTES:

Accessories

For Isolette® Infant Incubator accessories, see table 7-1 on page 7-3.

Table 7-1. Accessories List

Part Number	Description
83 444 00	IV pole assembly
83 442 00	Monitor shelf assembly, high
83 441 00	Swivel drawer assembly, small
83 440 00	Swivel drawer assembly, large
83 443 00	Oxygen tank bracket assembly
83 001 05	Ventilator tube support
83 610 70	Humidity system assembly, 120V (120V model only)
83 610 80	Humidity system assembly, 240V, English/Spanish/ French/German/Italian (240V model only)
83 610 90	Humidity system assembly, 100V (100V model only)
83 613 70	Humidity system, 120V (120V model only) ("02" series model only)
83 613 80	Humidity system, 240V, English/Spanish/French/ German/Italian (240V model only) ("02" series model only)
83 613 81	Humidity system, 240V, Swedish/Greek (240V model only) ("02" series model only)
83 613 90	Humidity system, 100V (100V model only) ("02" series model only)
83 620 50	Oxygen assembly, green, Diameter Index Safety System (DISS)
83 620 51	Oxygen assembly, green
83 620 52	Oxygen assembly, white
83 620 53	Oxygen assembly, blue
83 600 50	Scale assembly, Isolette® Infant Incubator

NOTES:

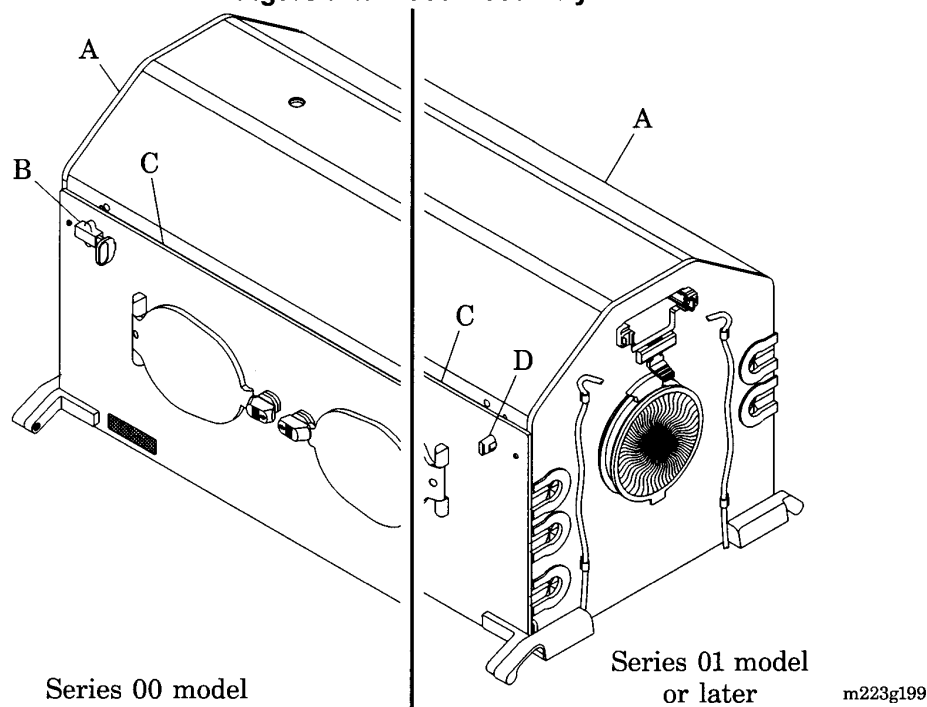
7.1 Weighing Scale

Tools required: None

Installation

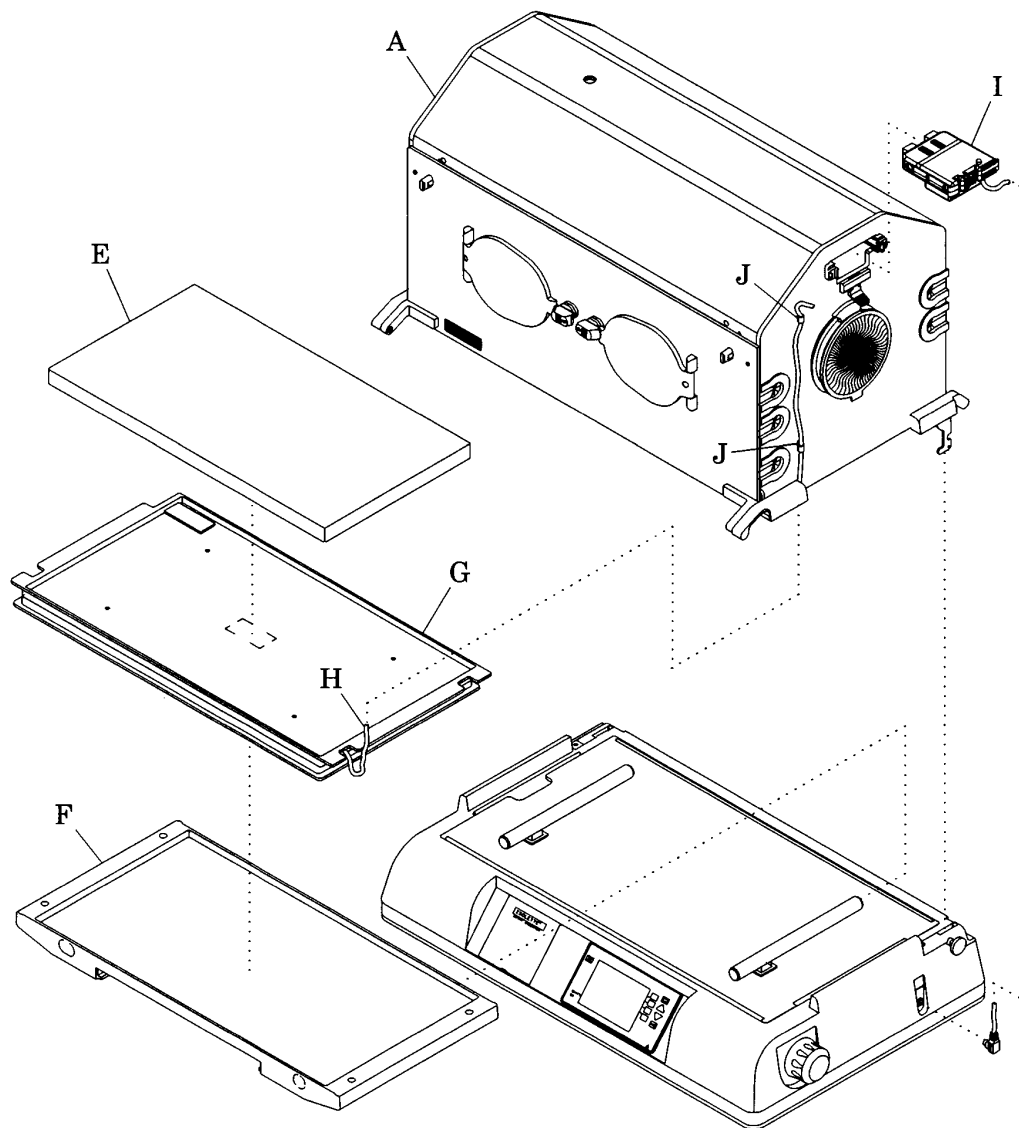
1. On a unit with a Series 00 hood assembly (A), slide the blue slide access panel latches (B), and open the access panel (C) (see figure 7-1 on page 7-5).
or
On a unit with a hood assembly (A) later than Series 00, rotate the access panel pawl latch knobs (D), and open the access panel (C).

Figure 7-1. Hood Assembly



2. Pivot the access panel (C) to the full-open position so it hangs straight down.
3. Remove the mattress (E) from the mattress tray (F) (see figure 7-2 on page 7-6).
4. Position the scale platform (G) so that its cable assembly (H) is to the right-hand side of the hood assembly (A), and place the scale platform (G) on the mattress tray (F).

Figure 7-2. Weighing Scale



NOTE:
Hood assembly and sensor module assembly shown removed for clarity. m223g083

5. Install the mattress (E) in the scale platform (G).
6. Connect the scale platform cable assembly (H) to the **Weight** connector on the sensor module assembly (I).
7. Ensure that there is sufficient slack in the scale platform cable assembly (H) between the edge of the hood assembly (A) and the scale platform (G):
 - a. Raise the hood assembly (A) to its full open position.
 - b. Fully withdraw the mattress tray (F) from the hood assembly (A).



WARNING:

Ensure all sensor leads are properly routed. Use cable management clips to avoid entanglement and possible infant injury.

8. Using the cable clips (J) provided, secure the scale platform cable assembly (H) to the inside wall of the hood assembly (A).
9. Calibrate the weighing scale (refer to procedure 6.4 on page 6-24).
10. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

Removal

Perform the installation procedure in reverse order.

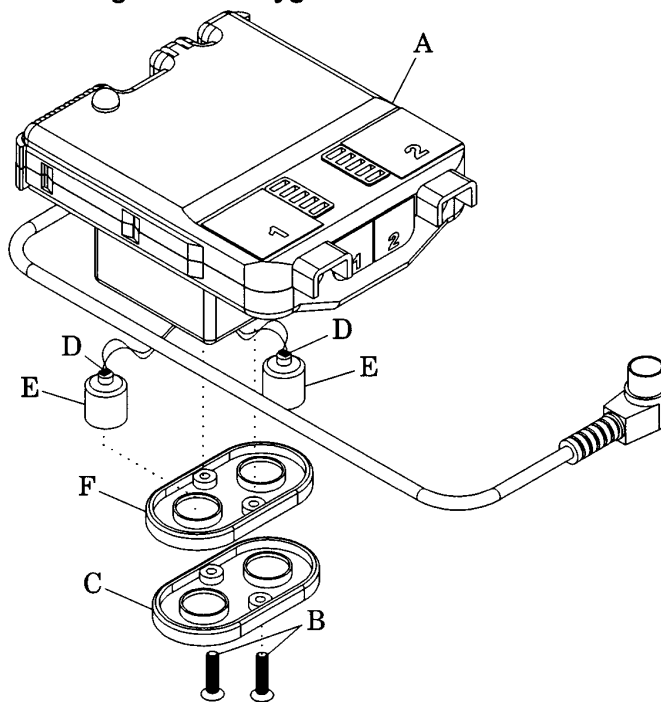
7.2 Oxygen System

Tools required: Phillips head screwdriver
Pliers
Flashlight

Installation

1. Remove the sensor module assembly (A) from the unit (refer to procedure 4.2 on page 4-6) (see figure 7-3 on page 7-8).

Figure 7-3. Oxygen Sensor Cells

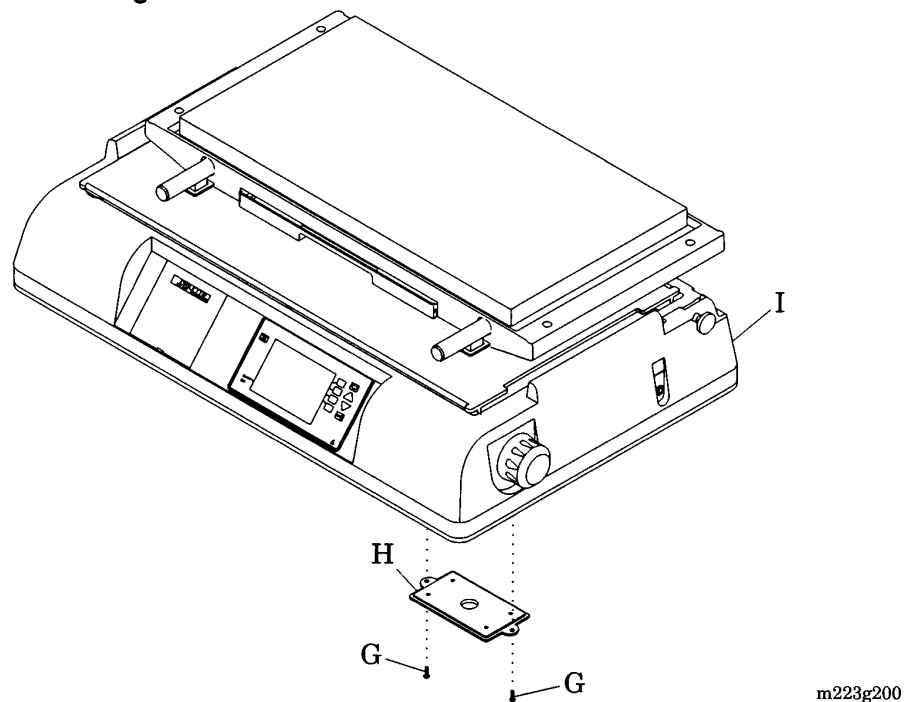


m223g092

2. Remove the two screws (B) that secure the oxygen sensor cover (C) to the sensor module assembly (A). **Retain** the two screws (B).
3. Remove the oxygen sensor cover (C) from the sensor module assembly (A).
4. Withdraw the sensor cell connectors (D) from the sensor module assembly (A).
5. Screw the oxygen sensor cells (E) into the oxygen cell mounting plate (F) provided.

6. Connect the oxygen sensor cells (E) to the sensor cell connectors (D).
7. Install the two screws (B) to secure the oxygen cell mounting plate (F) and the oxygen sensor cover (C) to the sensor module assembly (A).
8. Install the sensor module assembly (A) in the hood (refer to procedure 4.2 on page 4-6).
9. Remove the two Nylok®¹ screws (G) that secure the pneumatic module access door (H) to the shell assembly (I) (see figure 7-4 on page 7-9).
Discard the two Nylok® screws (G).

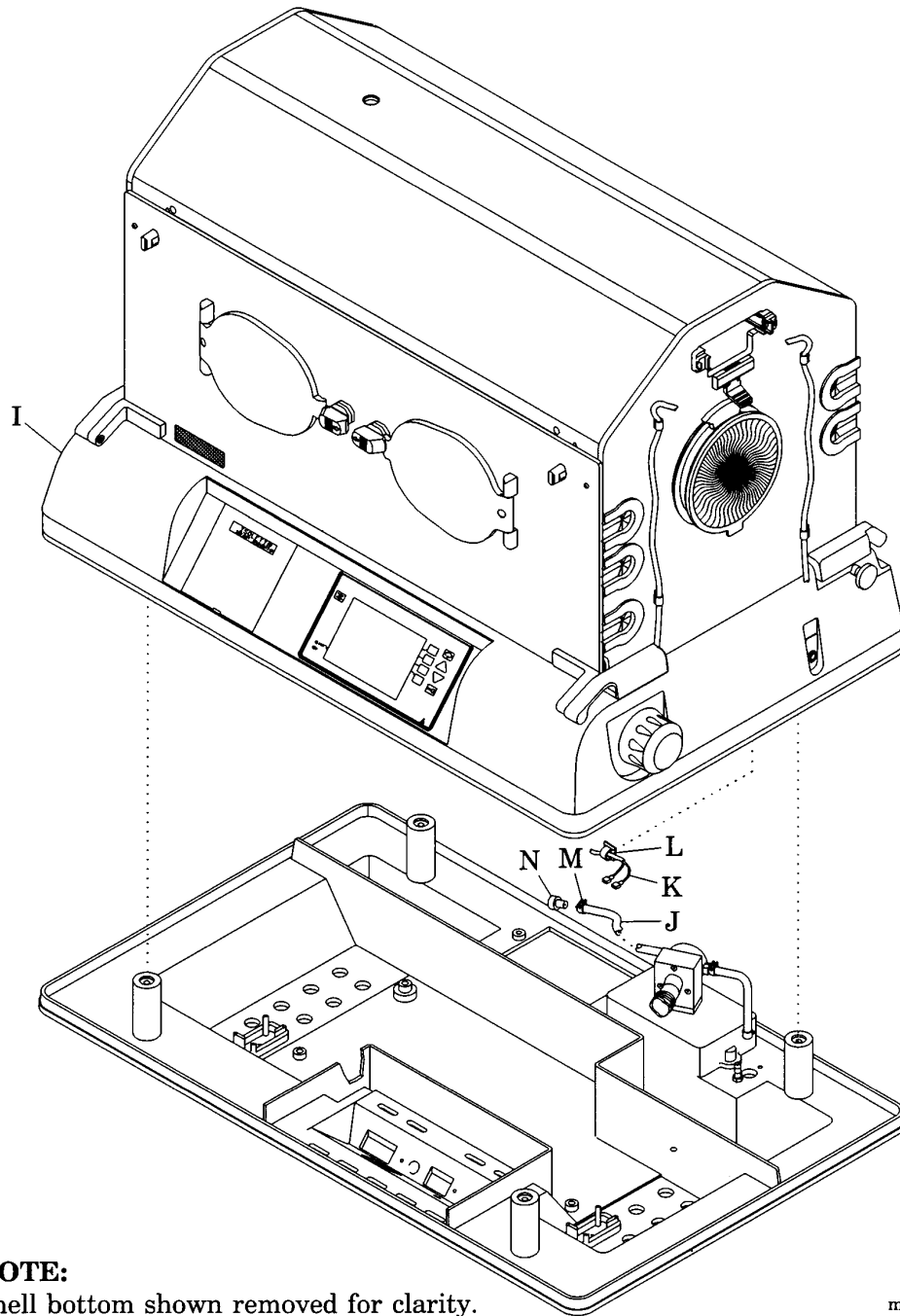
Figure 7-4. Pneumatic Module Access Door



10. Reach into the opening in the shell assembly (I), and perform the following (see figure 7-5 on page 7-10):
 - a. Using a flashlight, locate the oxygen hose (J).
 - b. Using a flashlight, locate the leads from the AC wiring harness assembly (K), and release them from the cord retaining clip (L) on the inside wall of the shell assembly (I).

1. Nylok® is a registered trademark of Nylok Fastener Corporation.

Figure 7-5. Shell Assembly

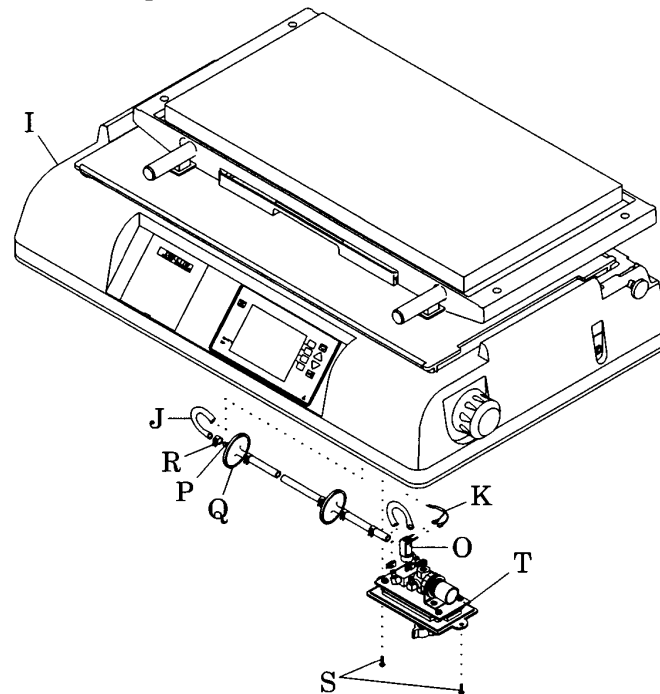


NOTE:
Shell bottom shown removed for clarity.

m223g201

- c. Using pliers, squeeze the retaining clamp (M) to release the plug (N) from the end of the oxygen hose (J).
 - d. Slide the retaining clamp (M) up the oxygen hose (J).
 - e. Remove and **discard** the plug (N).
11. Route the leads of the AC wiring harness assembly (K) down through the opening in the shell assembly (I), and connect them to the control valve assembly solenoid (O) (see figure 7-6 on page 7-11).

Figure 7-6. Control Valve Assembly



m223g094

12. Connect the oxygen hose (J) to the barb fitting (P) on the filter assembly (Q), and lock it in place with the retaining clip (R).
13. Install the two #8-32 screws (S) provided to secure the control valve assembly (T) and the hose hanger on the shell assembly (I).
14. On an oxygen system other than 83 620 50 (Oxygen assembly, green, Diameter Index Safety System (DISS)), install the oxygen fitting at the end of the hose on the control valve assembly (T).
15. Turn the unit's **Power** switch to the **On** position.

16. Calibrate the oxygen system at **21%** (refer to procedure 6.2 on page 6-19).
17. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

100% Calibration Fixture Installation

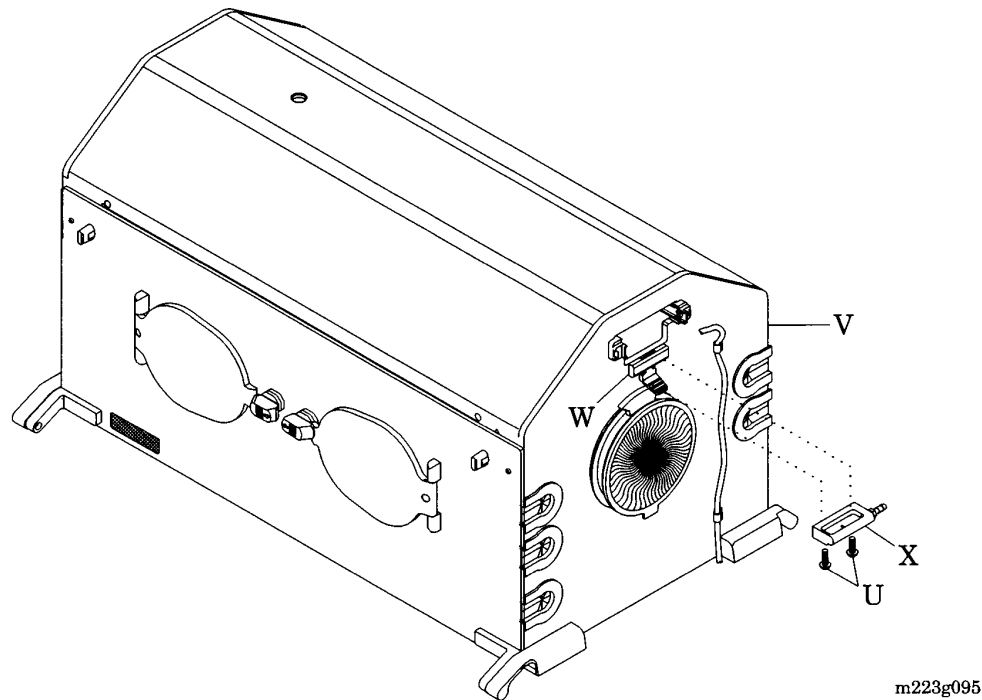
1. Remove the sensor module assembly (A) from the unit (see figure 7-3 on page 7-8) (refer to procedure 4.2 on page 4-6).

NOTE:

The 21% fixture is located under the sensor module opening.

2. Remove the two screws (U) that secure the 21% calibration fixture to the hood assembly (V) (see figure 7-7 on page 7-12). **Retain** the two screws (U).

Figure 7-7. 100% Oxygen Calibration Fixture



3. Install the two screws (U) to secure the slide lock (W) and the 100% calibration fixture (X) directly under the opening in the hood assembly (V).
4. Install the sensor module assembly (A) (see figure 7-3 on page 7-8) (refer to procedure 4.2 on page 4-6).

5. Activate the oxygen system, and select the **100%** calibration level.
6. Calibrate the oxygen system at **100%** (refer to procedure 6.2 on page 6-19).
7. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

Removal

Perform the installation procedure in reverse order.

7.3 Humidity System

Tools required: Small screwdriver or similar device

Preparing the Shell Assembly

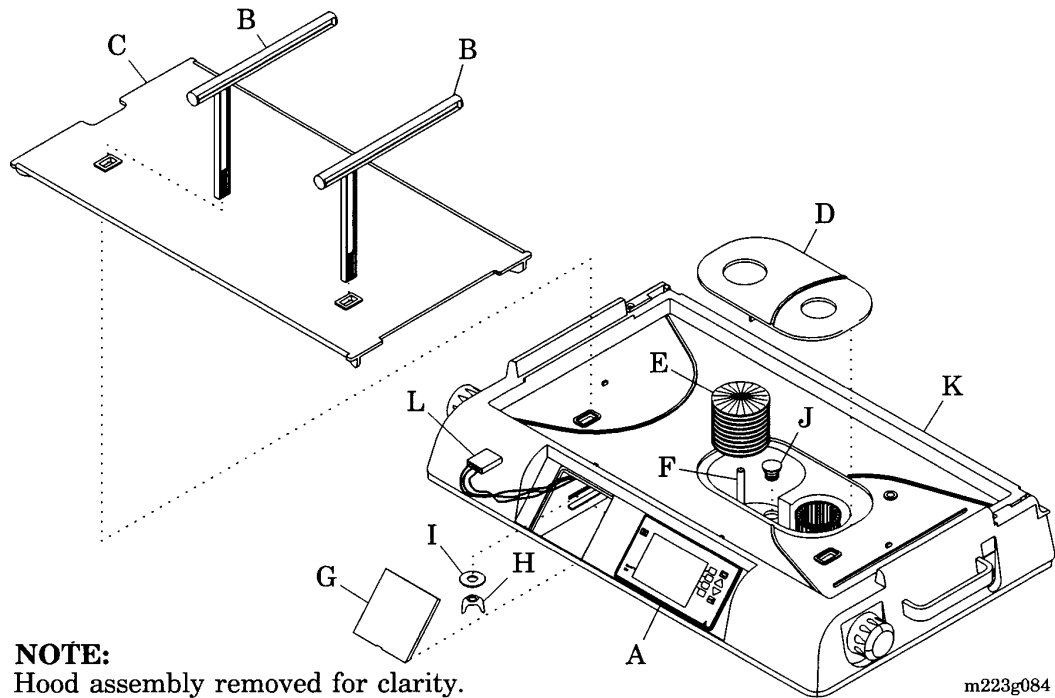


SHOCK HAZARD:

Unplug the power cord from the unit. Failure to do so could result in personal injury or equipment damage.

1. Unplug the power cord from the back of the controller (A) (see figure 7-8 on page 7-14).

Figure 7-8. Shell Assembly



NOTE:

Hood assembly removed for clarity.

2. Lift the hood assembly, and carefully tilt it back to its open position.
3. Remove the mattress, the mattress tray, and the x-ray tray from the unit (refer to procedure 4.7 on page 4-18).
4. Pull the two mattress tilt bars (B) up through the main deck (C), and remove them from the unit.
5. Remove the main deck (C) from the unit.



WARNING:

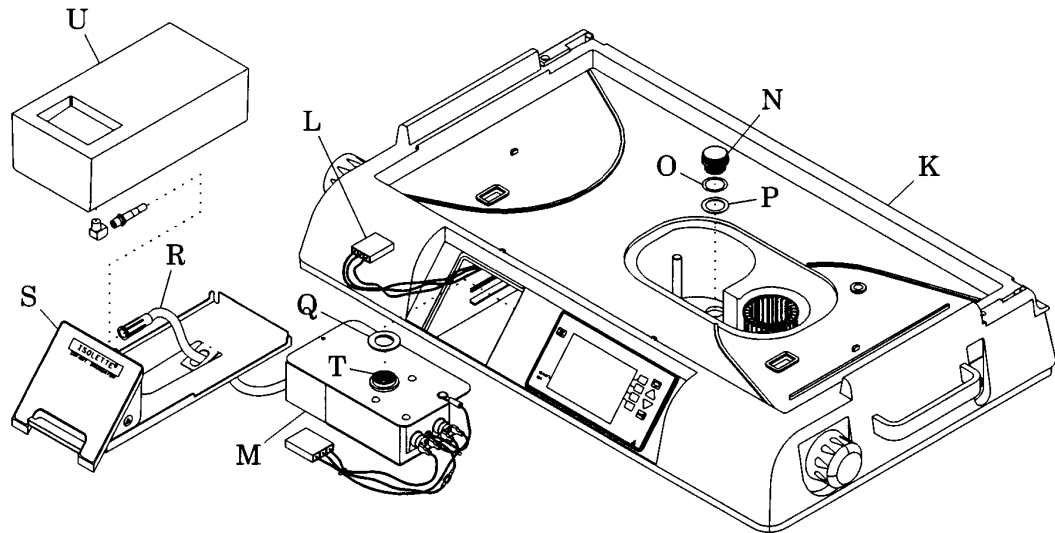
Allow 45 minutes for the heater assembly to cool. Failure to do so could result in personal injury.

6. Allow 45 minutes for the unit to cool.
7. Remove the heater/impeller cover (D) from the unit.
8. Remove the heater radiator (E) by unscrewing it from the heater assembly (F).
9. Insert and turn the end of a small screwdriver or similar device into the slot at the bottom center of the humidity cover (G), and remove the humidity cover (G) from the unit.
10. Reach into the humidity cavity, and perform the following:
 - a. Locate and remove the wingnut (H) and the flatwasher (I) that secure the hole plug (J) to the inside of the shell assembly (K).
 - b. Locate and remove the humidity connector of the AC wiring harness assembly (L), and pull it through the opening to the humidity cavity.
11. Remove the hole plug (J) from the shell assembly (K).
12. Install the humidity system:
 - For Series 00 and 01 models, refer to “Installing the Humidity System (Series 00 and 01 Models)” on page 7-16.
 - For Series 02 models, refer to “Installing the Humidity System (Series 02 Models)” on page 7-18.

Installing the Humidity System (Series 00 and 01 Models)

1. Connect the AC wiring harness assembly (L) to the connector of the evaporator assembly (M) (see figure 7-9 on page 7-16).

Figure 7-9. Humidity System (Series 00 and 01 Models)



m223g086

2. Remove the humidity cap (N), the metal washer (O), and the O-ring (P) from the top of the evaporator assembly (M). Leave the polypropylene washer (Q) in place.
3. Thread the humidity hose (R) through the round hole in the humidity tray (S), and connect it to the barb fitting on the side of the evaporator assembly (M).
4. Place the evaporator assembly (M) into the shell assembly (K), and insert its collar (T) through the hole in the top of the shell assembly (K).
5. Install the O-ring (P), the metal washer (O), and the humidity cap (N) to secure the evaporator assembly (M) to the shell assembly (K).
6. Secure the humidity hose (R) in the retaining clip located on the bottom of the opening in the humidity tray (S).

7. Slide the end of the humidity tray (S) into the shell assembly (K).
8. Connect the humidity hose (R) to the humidity reservoir (U).
9. Install the humidity reservoir (U) in the humidity tray (S).
10. Screw the heater radiator (E) onto the heater assembly (F) (see figure 7-8 on page 7-14).
11. Install the heater/impeller cover (D) and the main deck (C) on the unit.
12. Slide the two mattress tilt bars (B) through their slots in the main deck (C).
13. Install the mattress, the mattress tray, and the x-ray tray on the unit (refer to procedure 4.7 on page 4-18).
14. Carefully lower the hood assembly to its closed position.



CAUTION:

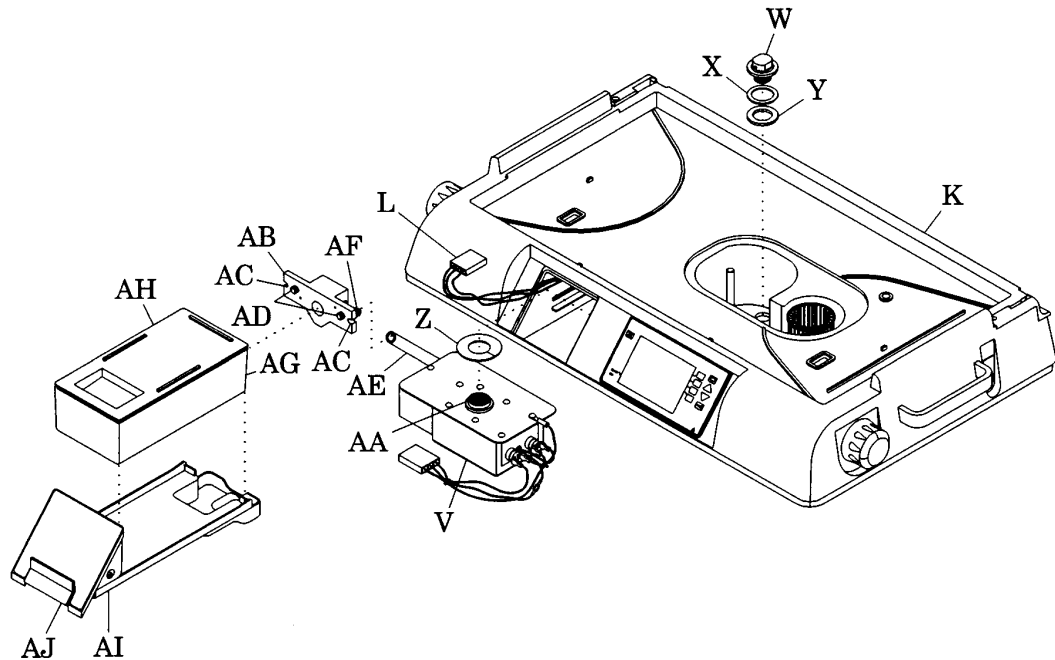
To prolong the useful life of the humidity system, use **only** distilled water. Sterile water is **not** an acceptable substitute for distilled water. Equipment damage could occur.

15. Fill the humidity reservoir (U) with distilled water (refer to procedure 6.7 on page 6-33) (see figure 7-9 on page 7-16).
16. Slide the humidity tray (S) completely into the shell assembly (K).
17. Activate the humidity system.
18. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

Installing the Humidity System (Series 02 Models)

1. Connect the AC wiring harness assembly (L) to the connector of the evaporator assembly (V) (see figure 7-10 on page 7-18).

Figure 7-10. Humidity System (Series 02 Models)



m223g087

2. Remove the evaporator cap (W), the stainless steel flat washer (X), and the silicone flat washer (Y) from the top of the evaporator assembly (V). Leave the polypropylene flatwasher (Z) in place.
3. Place the evaporator assembly (V) into the shell assembly (K), and insert its collar (AA) through the hole in the top of the shell assembly (K).
4. Install the evaporator cap (W), the stainless steel flatwasher (X), and the silicone flatwasher (Y) to secure the evaporator assembly (V) to the shell assembly (K).
5. Orient the humidity manifold assembly (AB) provided so that its mounting tabs (AC) are horizontal and to the front, and slide the humidity manifold assembly (AB) to the rear of the humidity cavity.

6. Reach into the humidity cavity, and turn the thumbscrews (AD) on the humidity manifold assembly (AB) two counterclockwise turns to secure the humidity manifold assembly (AB). Ensure that the humidity manifold assembly (AB) is secured.



CAUTION:

To prevent damage to the collar that secures the evaporator assembly to the shell assembly, be careful not to twist the evaporator assembly around the horizontal axis when installing its tubing.

7. Connect the tubing (AE) from the evaporator assembly (V) to the barb fitting (AF) on the humidity manifold assembly (AB). Do **not** twist the evaporator assembly (V) around the horizontal axis.
8. Mount the humidity reservoir (AG) and its lid (AH) provided on the humidity tray (AI) provided.
9. Slide the end of the humidity tray (AI) into the shell assembly (K).



CAUTION:

To prolong the useful life of the humidity system, use **only** distilled water. Sterile water is **not** an acceptable substitute for distilled water. Equipment damage could occur.

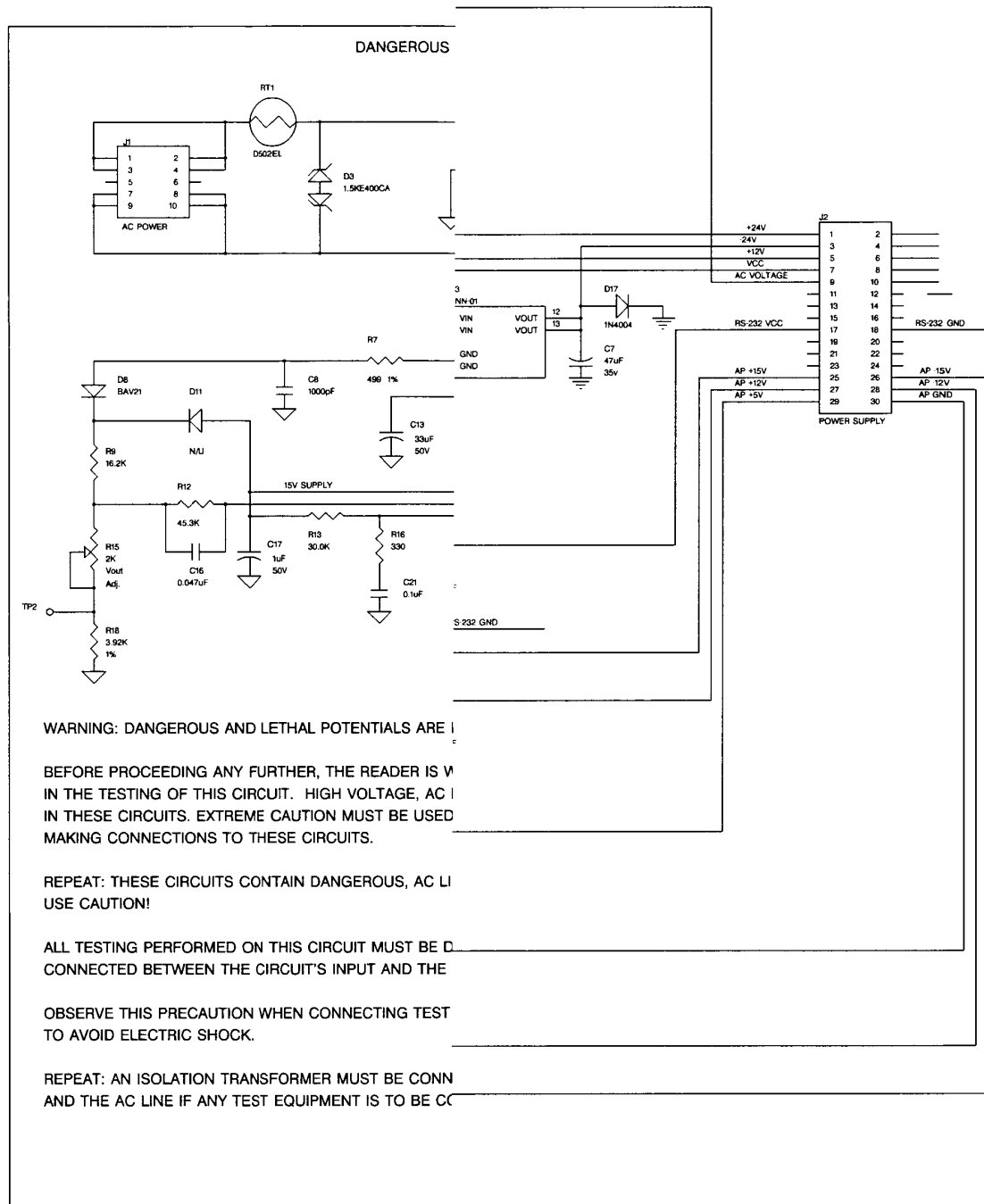
10. Fill the humidity reservoir (AG) with distilled water (refer to procedure 6.7 on page 6-33).
11. Slide the humidity tray (AI) completely into the shell assembly (K), and lock the handle (AJ).
12. Screw the heater radiator (E) onto the heater assembly (F) (see figure 7-8 on page 7-14).
13. Install the heater/impeller cover (D) and the main deck (C) on the unit.
14. Slide the two mattress tilt bars (B) through their slots in the main deck (C).
15. Install the mattress, the mattress tray, and the x-ray tray on the unit (refer to procedure 4.7 on page 4-18).
16. Carefully lower the hood assembly to its closed position.
17. Activate the humidity system.

18. To ensure proper operation of the Isolette® Infant Incubator, perform the “Function Checks” on page 2-6.

Removing the Humidity System

Perform the installation procedure in reverse order.

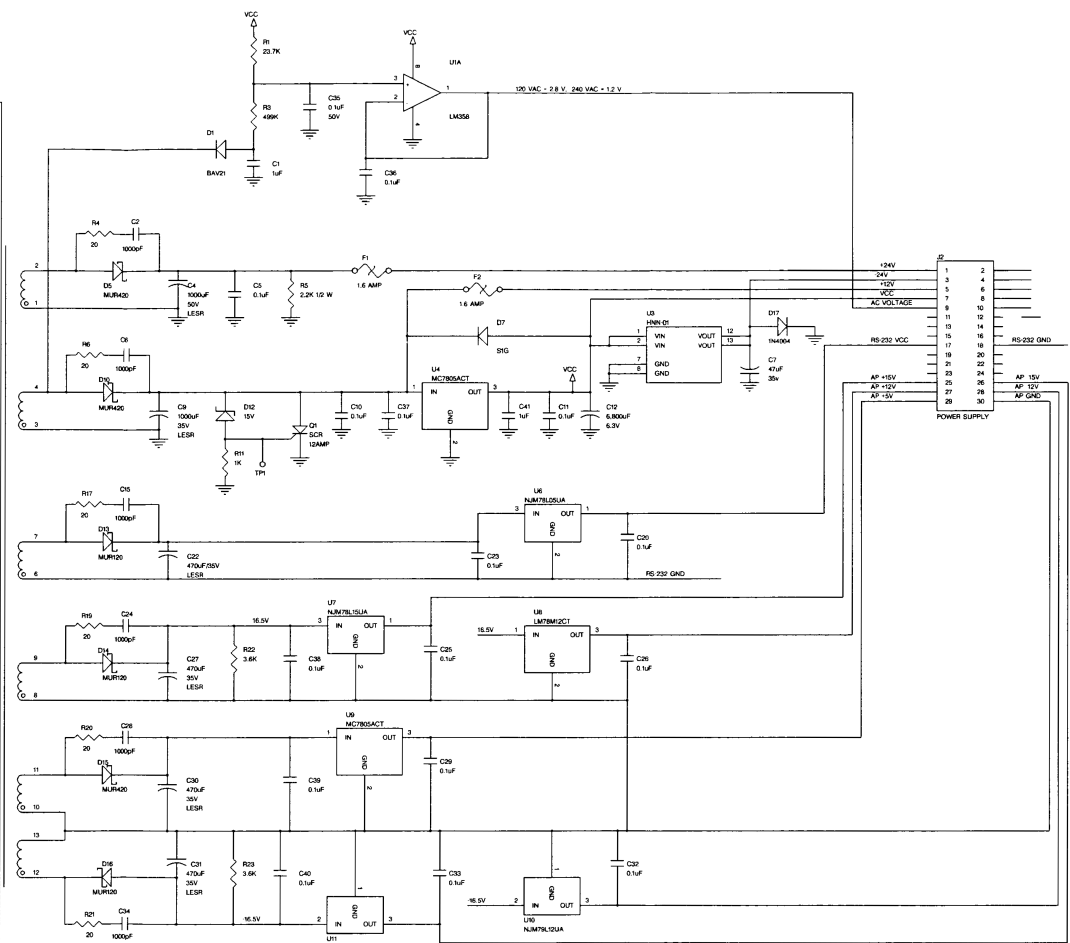
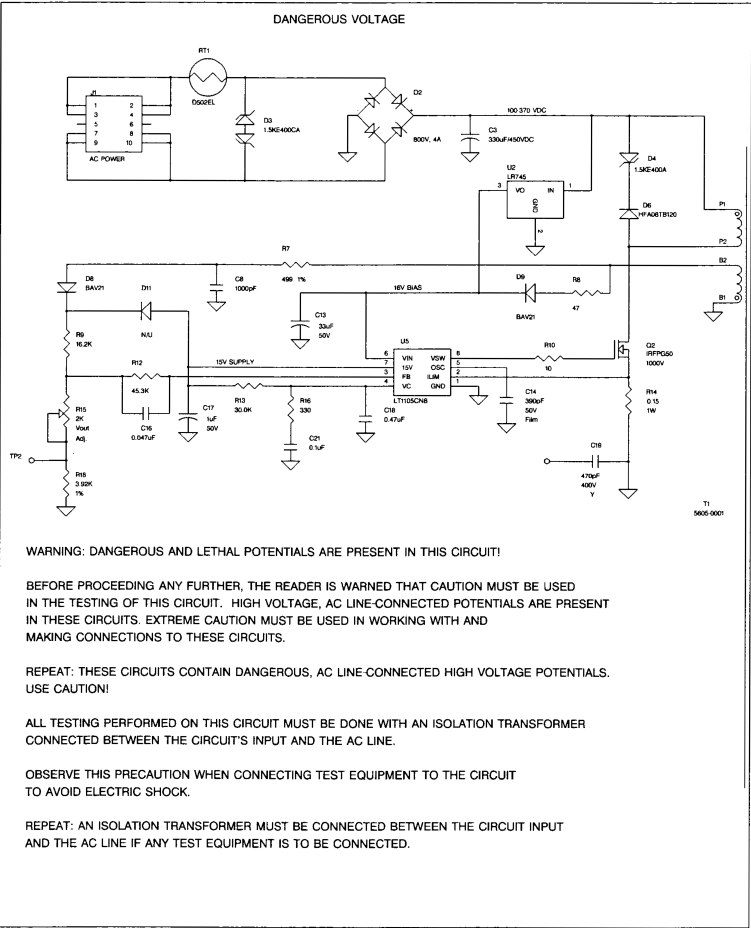
Controller Power Supply Sc



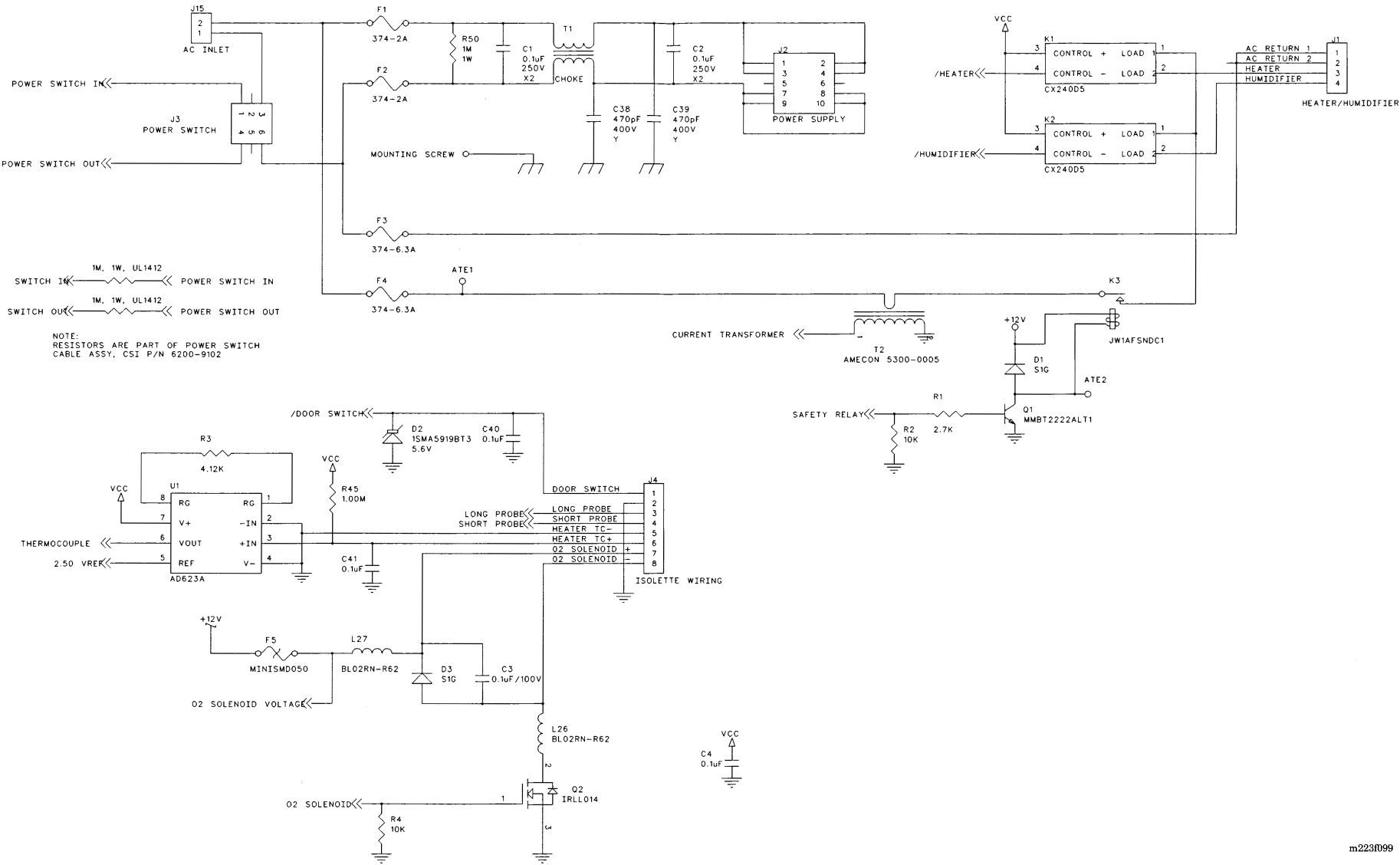
m223f105

FO 3-1

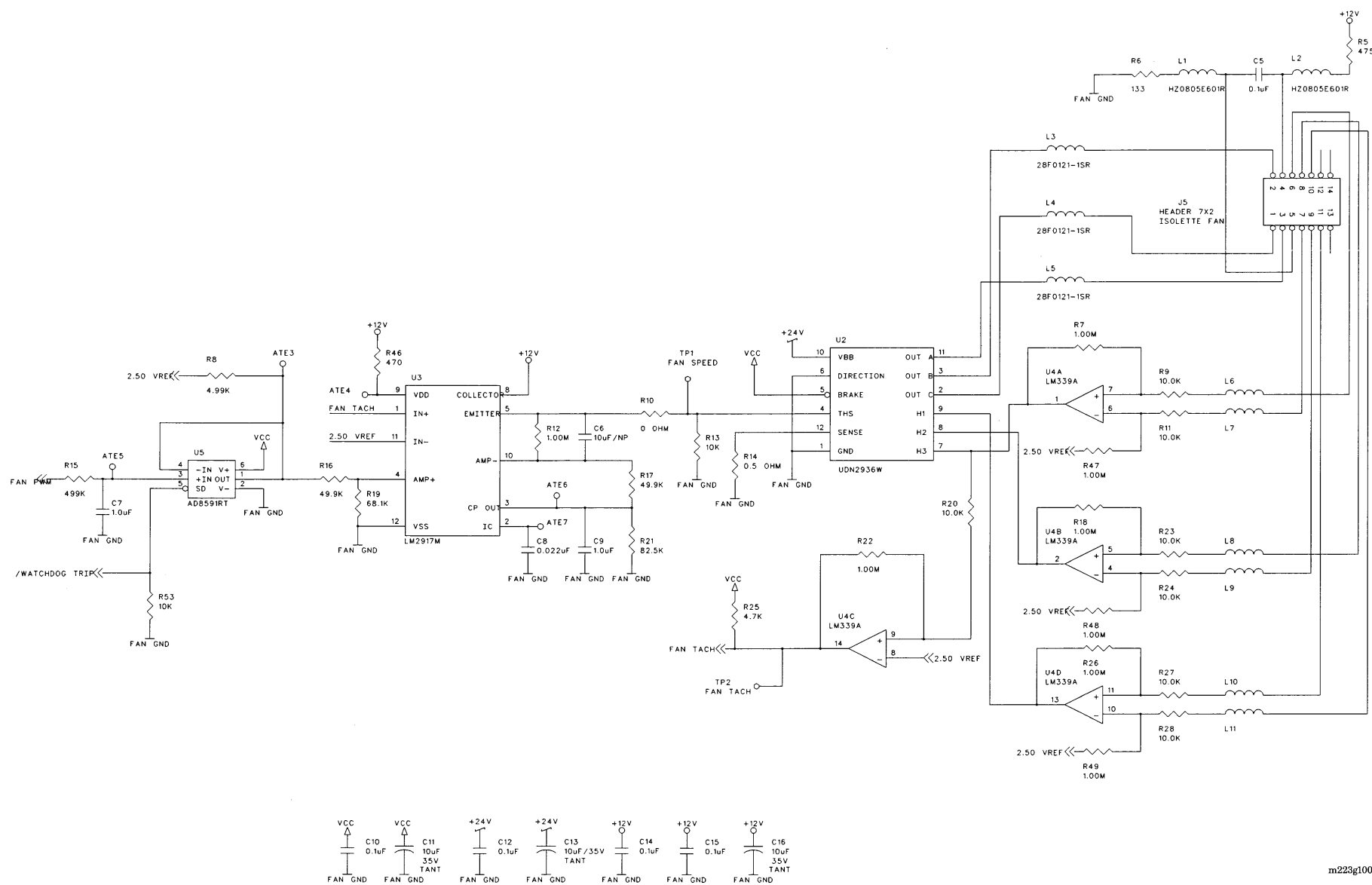
Controller Power Supply Schematic Diagram



Interface P.C. Board Schematic Diagram (Sheet 1 of 5)



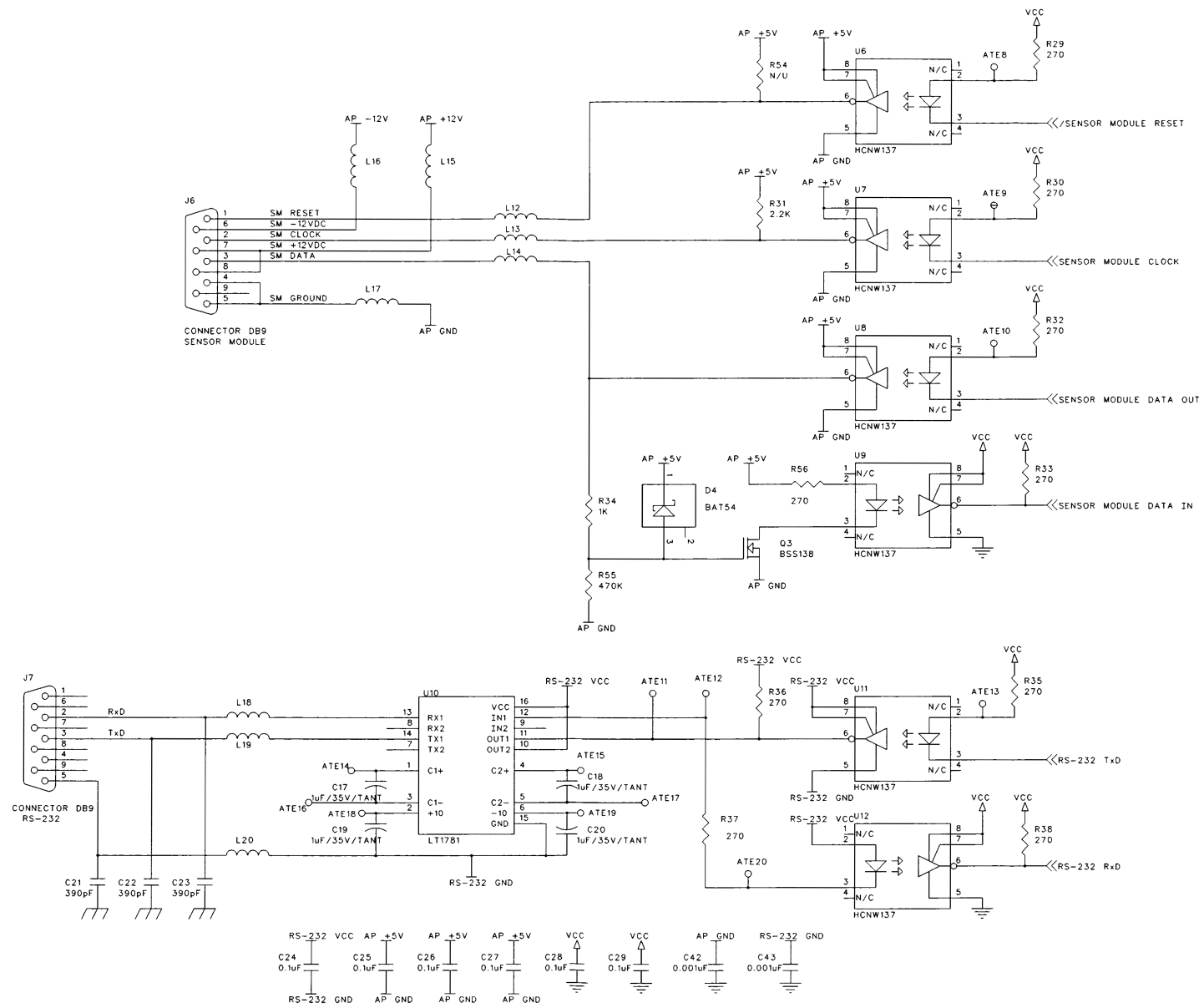
Interface P.C. Board Schematic Diagram (Sheet 2 of 5)



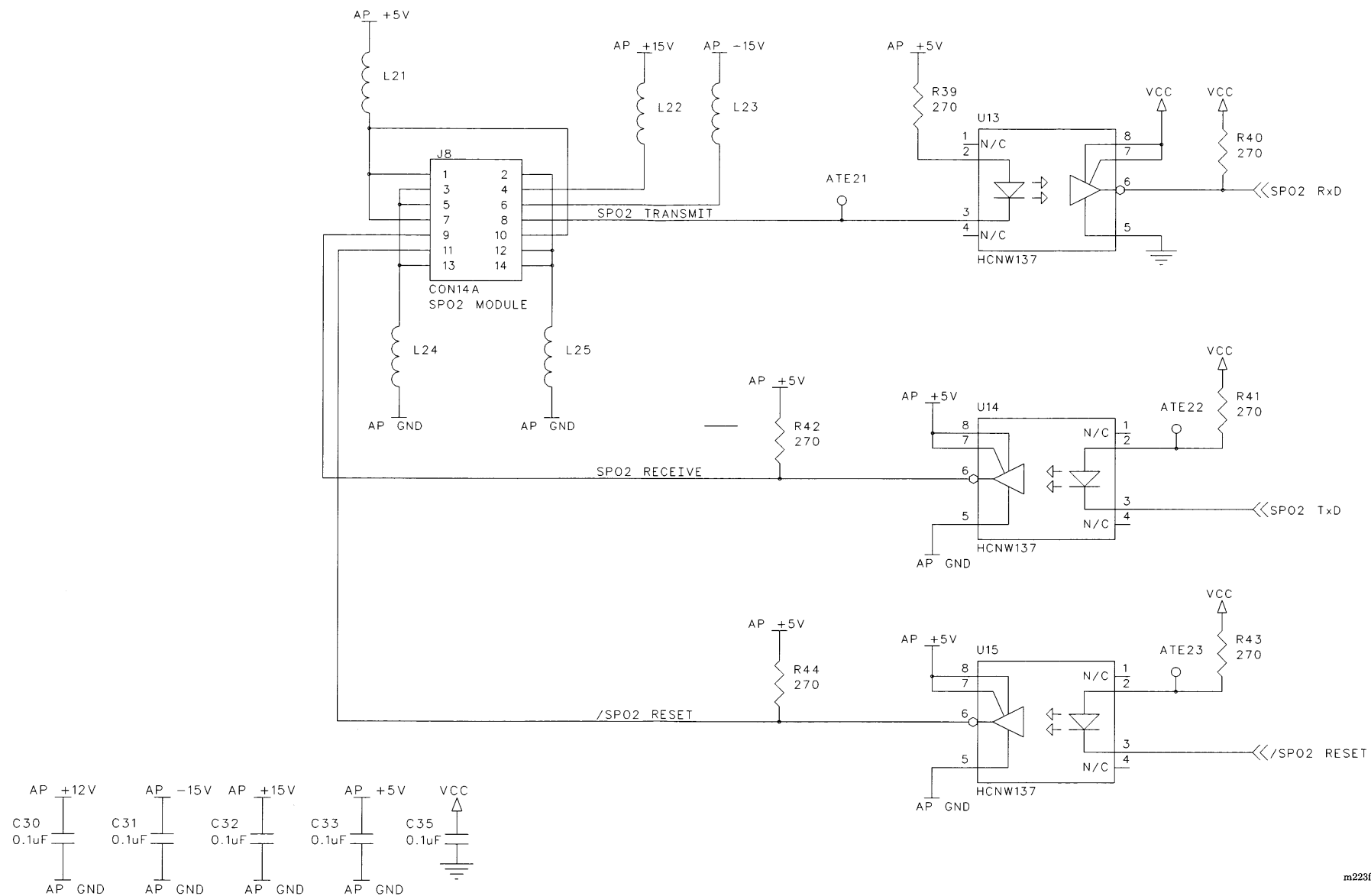
m223g100

FO 3-2.2

Interface P.C. Board Schematic Diagram (Sheet 3 of 5)



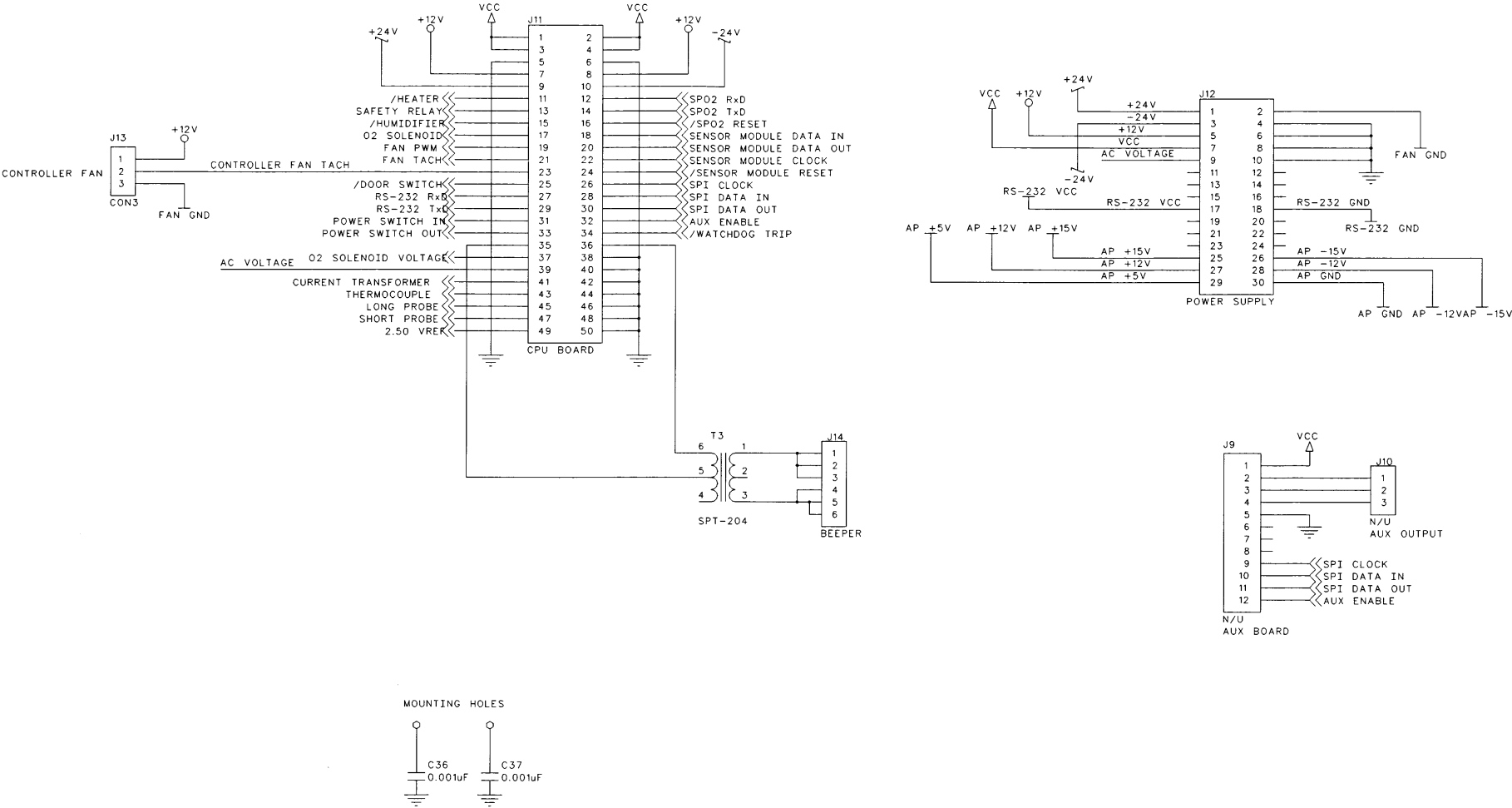
Interface P.C. Board Schematic Diagram (Sheet 4 of 5)



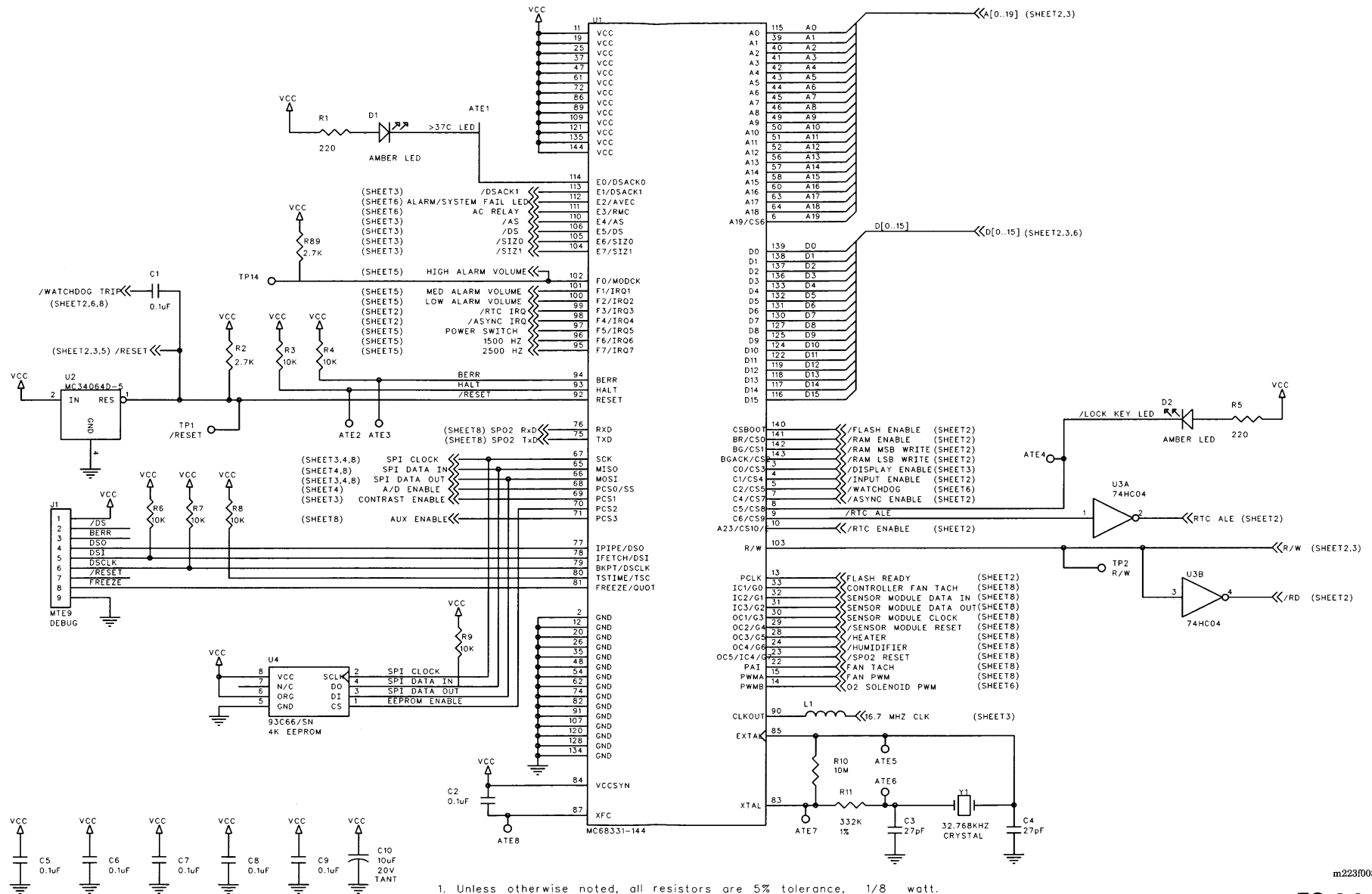
m223f02

FO 3-2.4

Interface P.C. Board Schematic Diagram (Sheet 5 of 5)



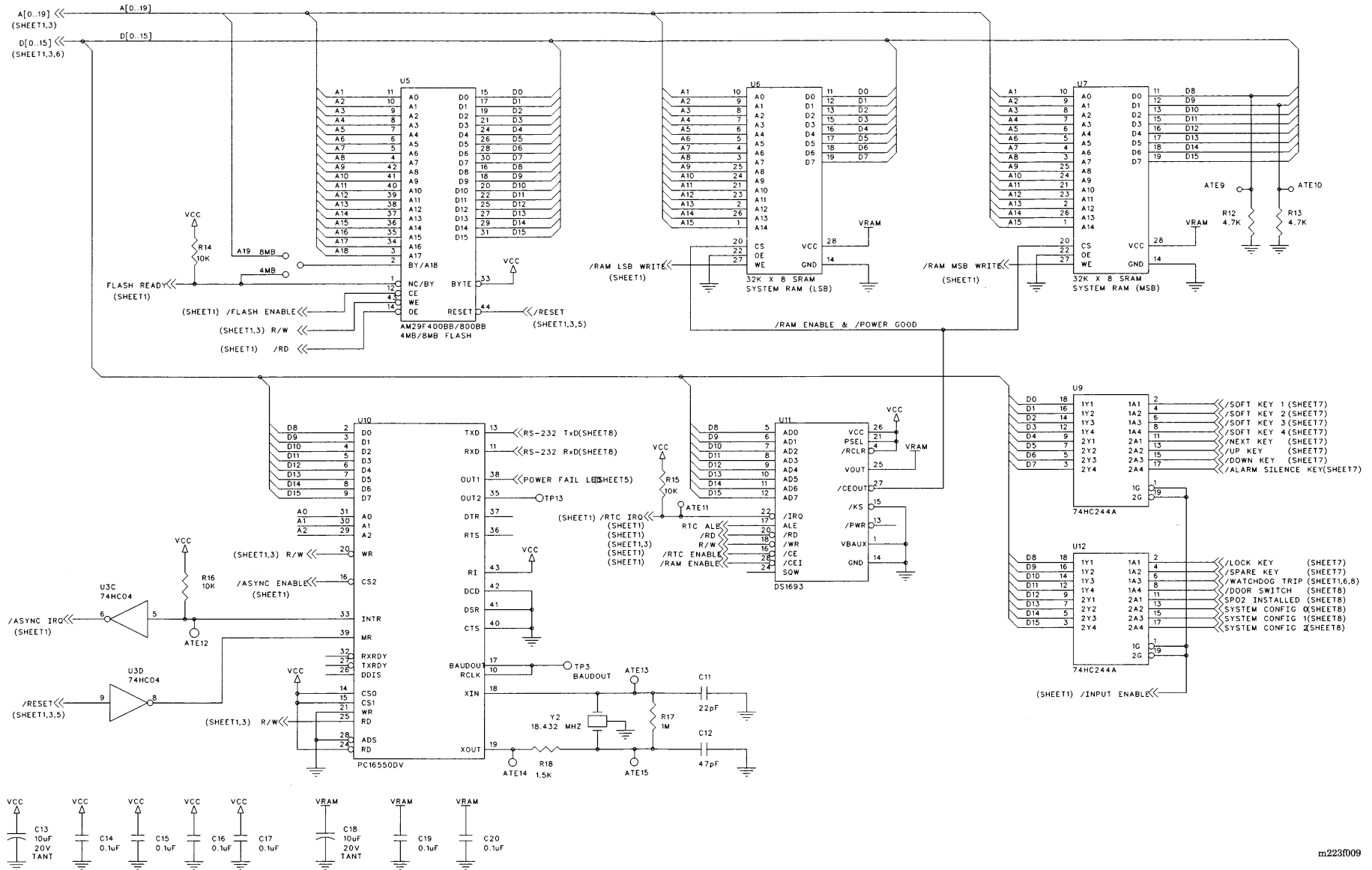
Central Processing Unit P.C. Board Schematic Diagram (Sheet 1 of 8)



m223/008

FO 3-3.1

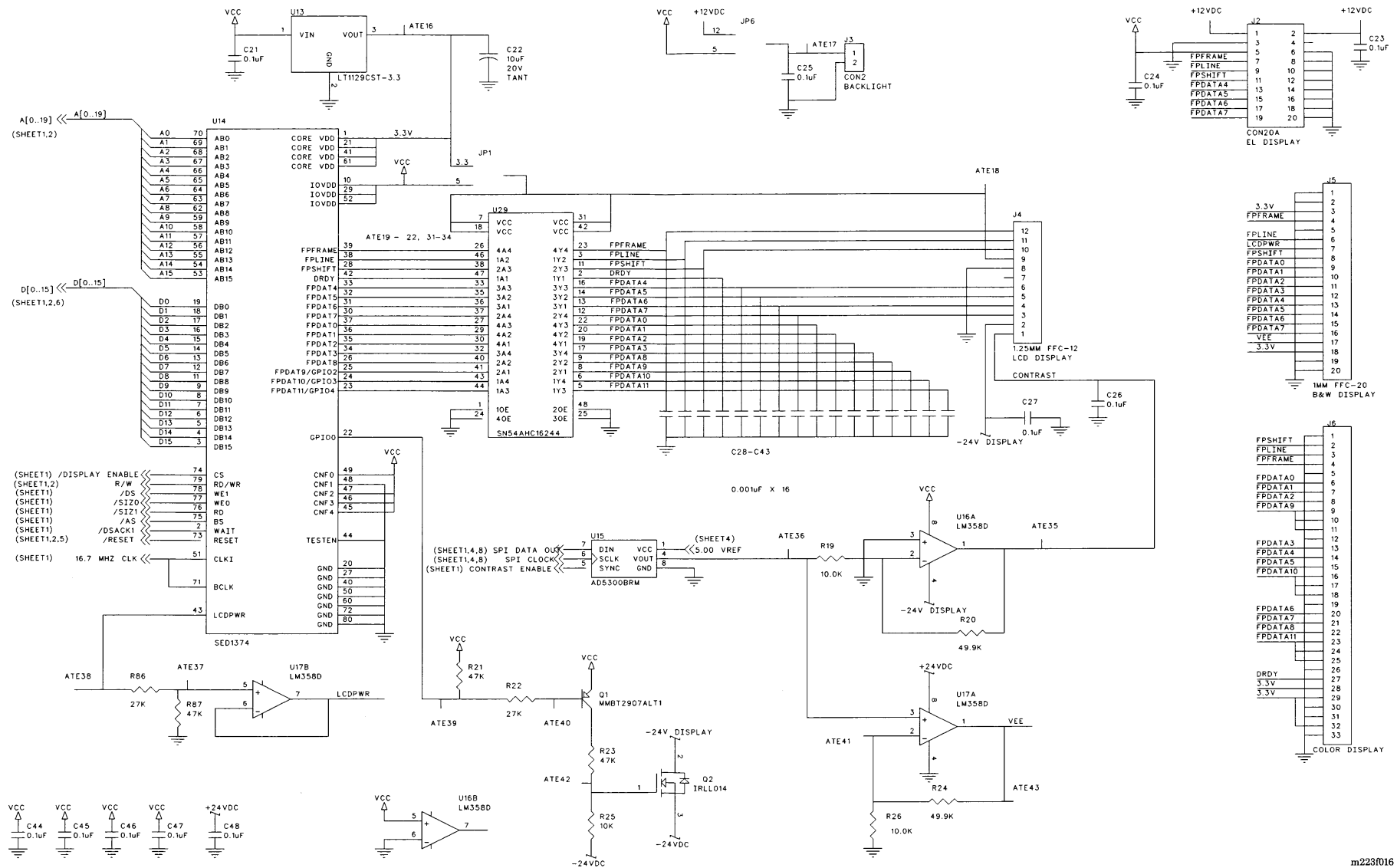
Central Processing Unit P.C. Board Schematic Diagram (Sheet 2 of 8)



m223f009

FO 3-3.2

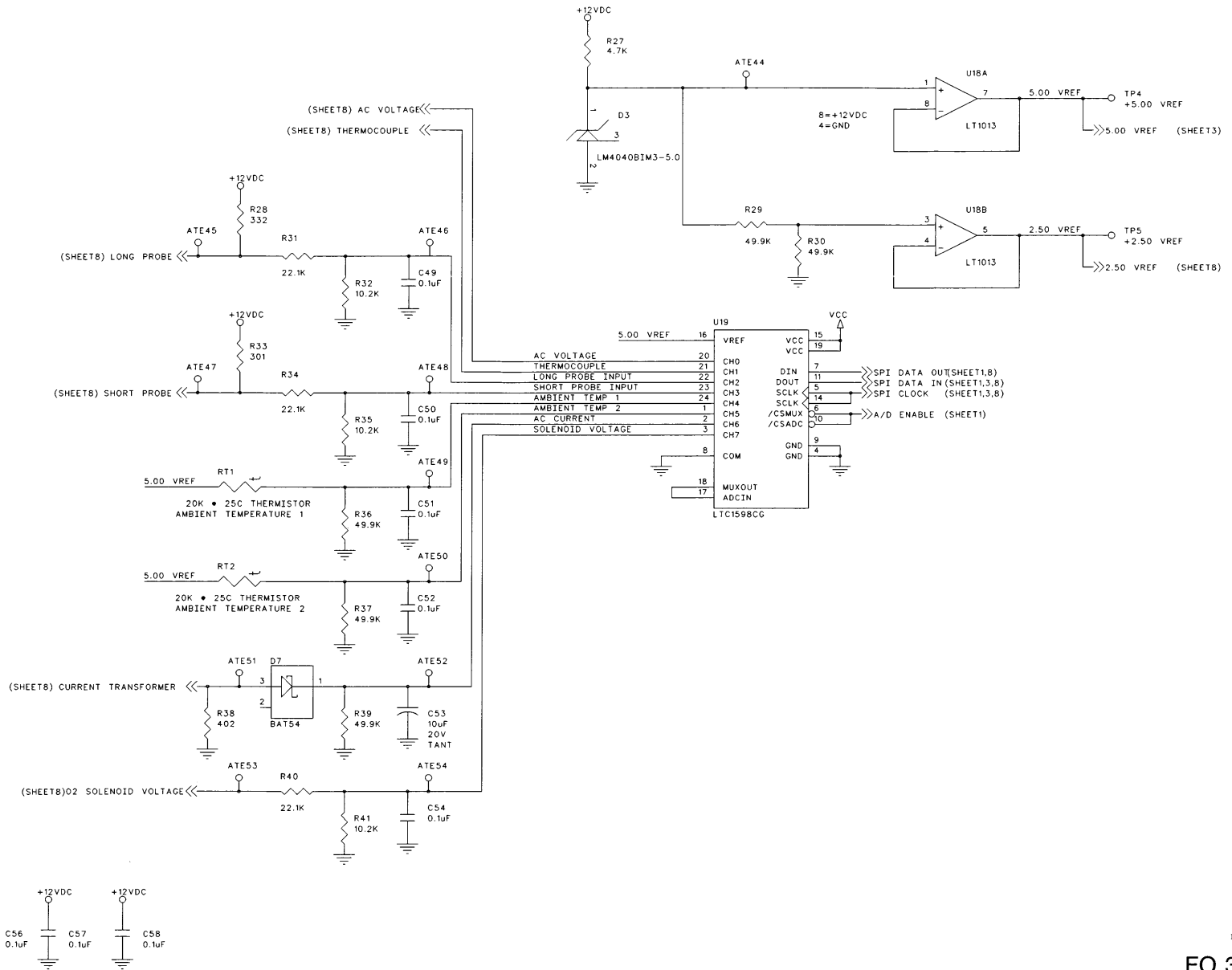
Central Processing Unit P.C. Board Schematic Diagram (Sheet 3 of 8)



m223r016

FO 3-3.3

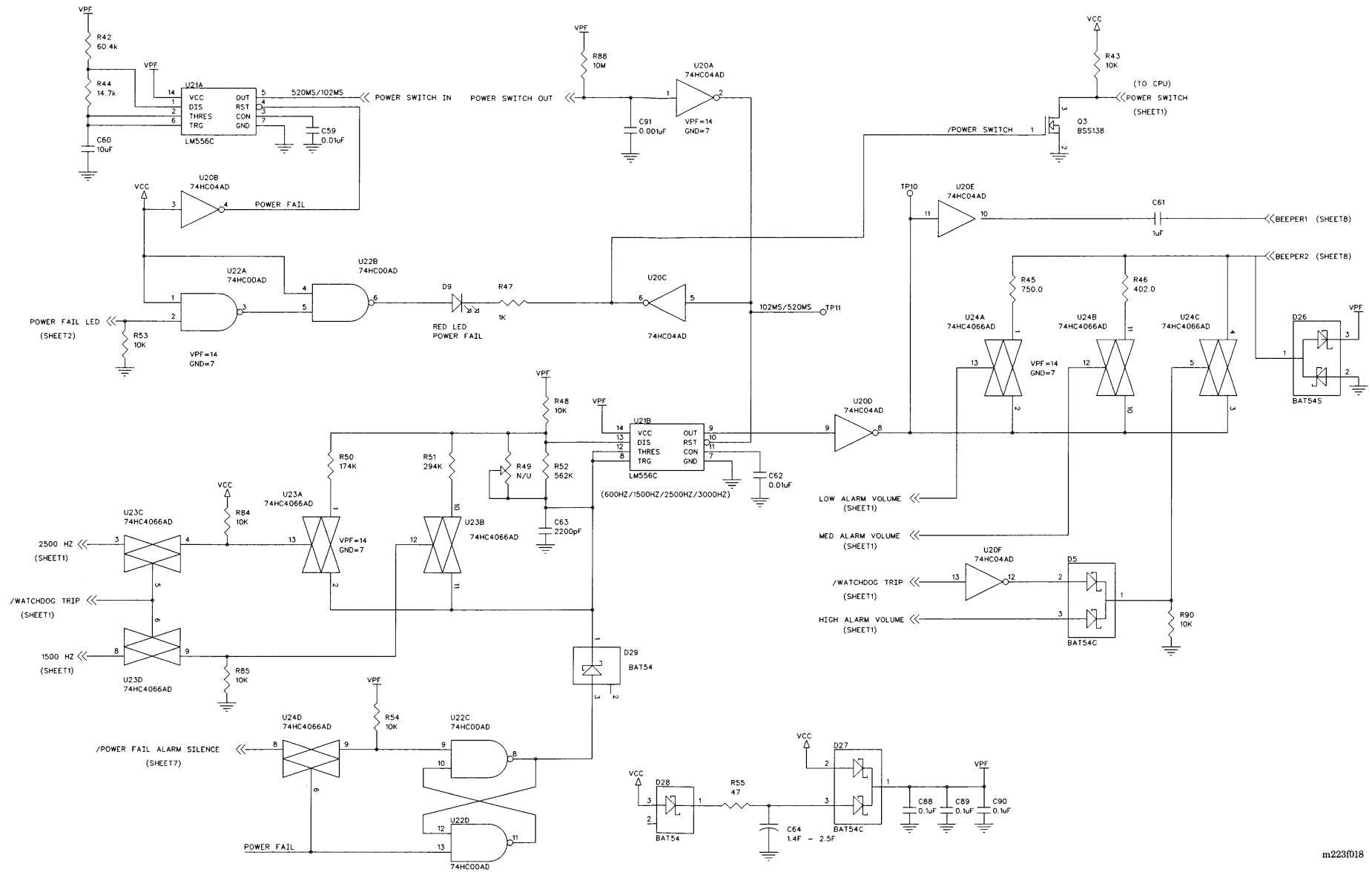
Central Processing Unit P.C. Board Schematic Diagram (Sheet 4 of 8)



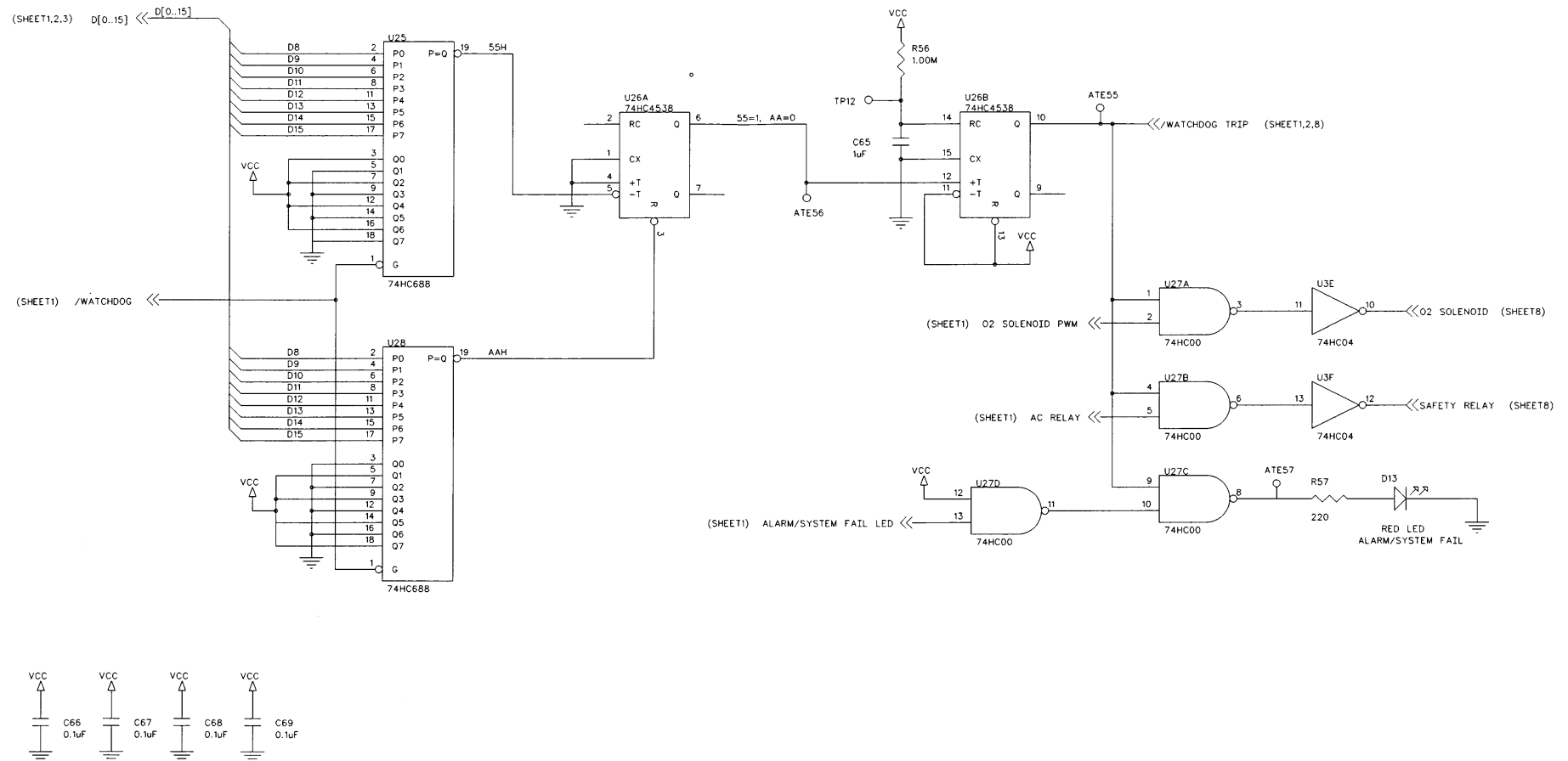
m223f017

FO 3-3.4

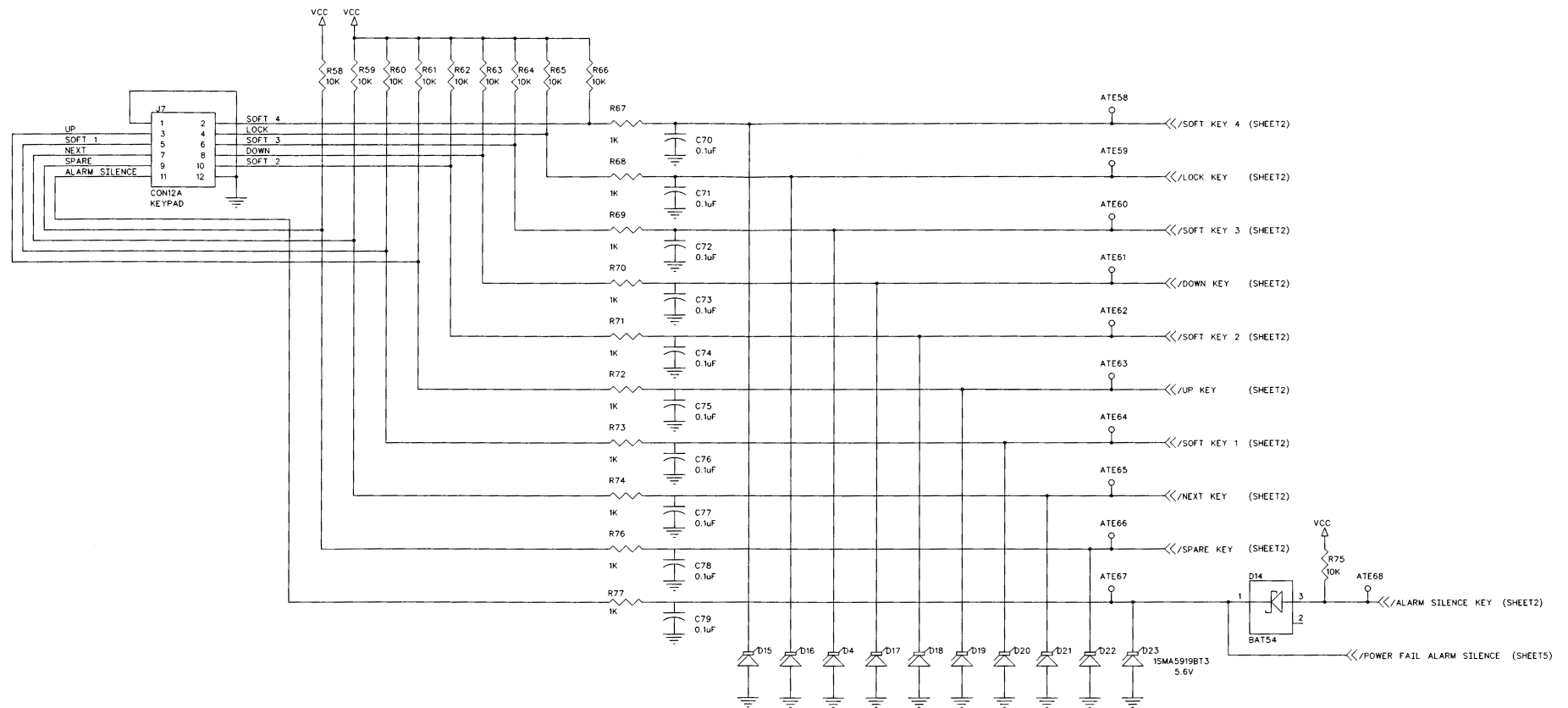
Central Processing Unit P.C. Board Schematic Diagram (Sheet 5 of 8)



Central Processing Unit P.C. Board Schematic Diagram (Sheet 6 of 8)



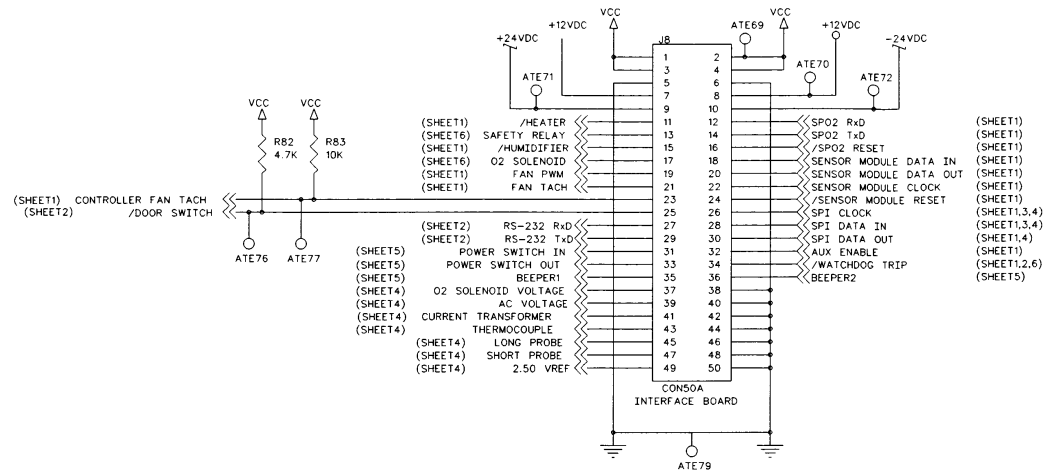
Central Processing Unit P.C. Board Schematic Diagram (Sheet 7 of 8)



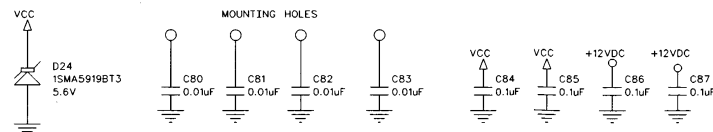
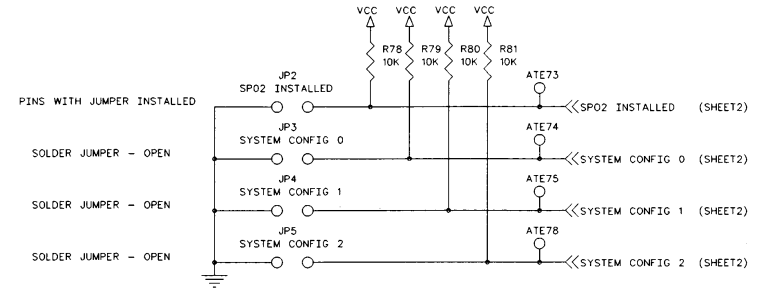
m223f020

FO 3-3.7

Central Processing Unit P.C. Board Schematic Diagram (Sheet 8 of 8)



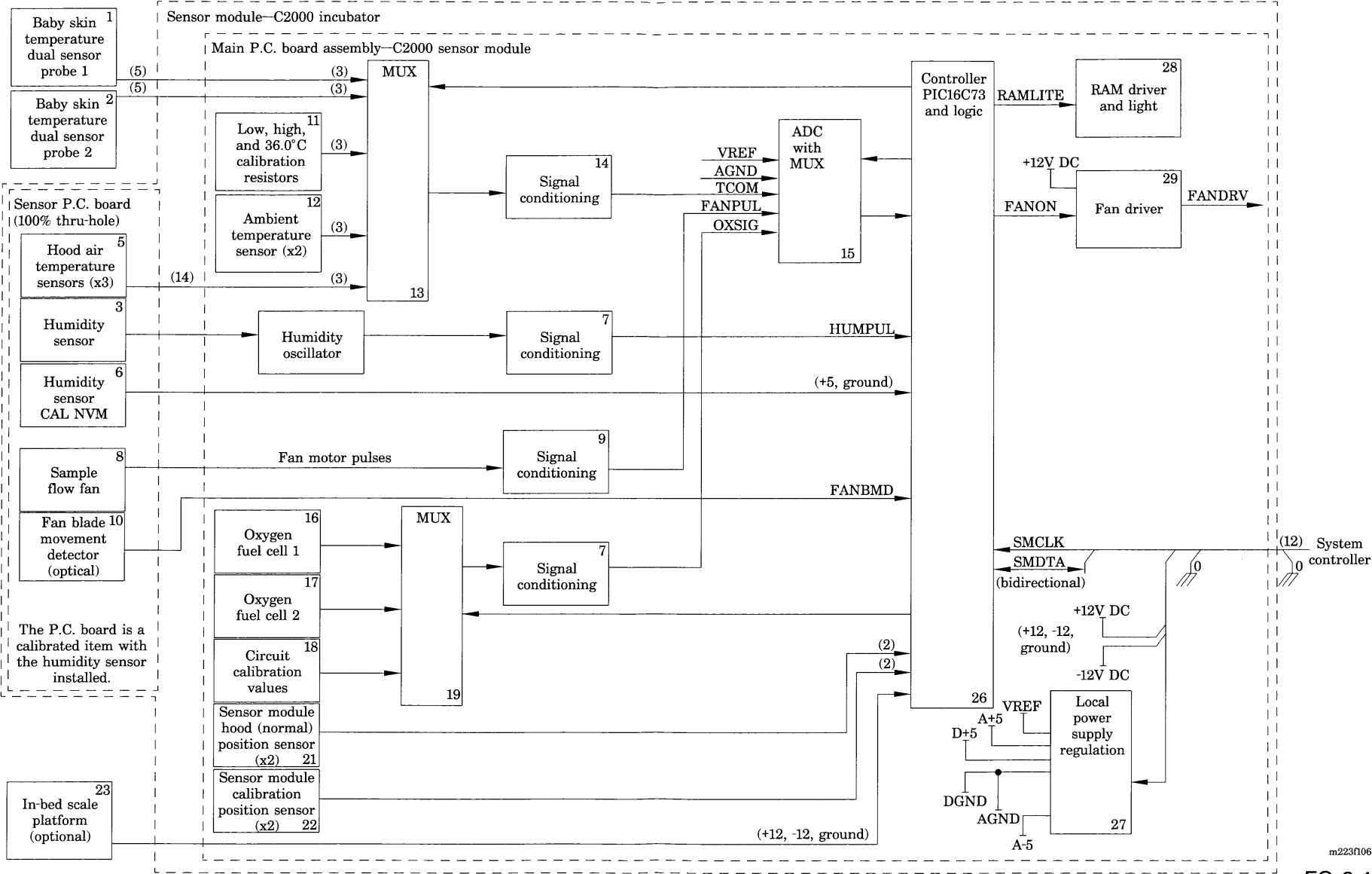
NOTE: RIBBON CABLE TO HAVE FERRITE CLAMP INSTALLED NEAR CPU BOARD.



m223f021

FO 3-3.8

Sensor Module Functional Block Diagram



m223f06

Sensor Module P.C. Board Schematic Diagram (Sheet 1 of 4)

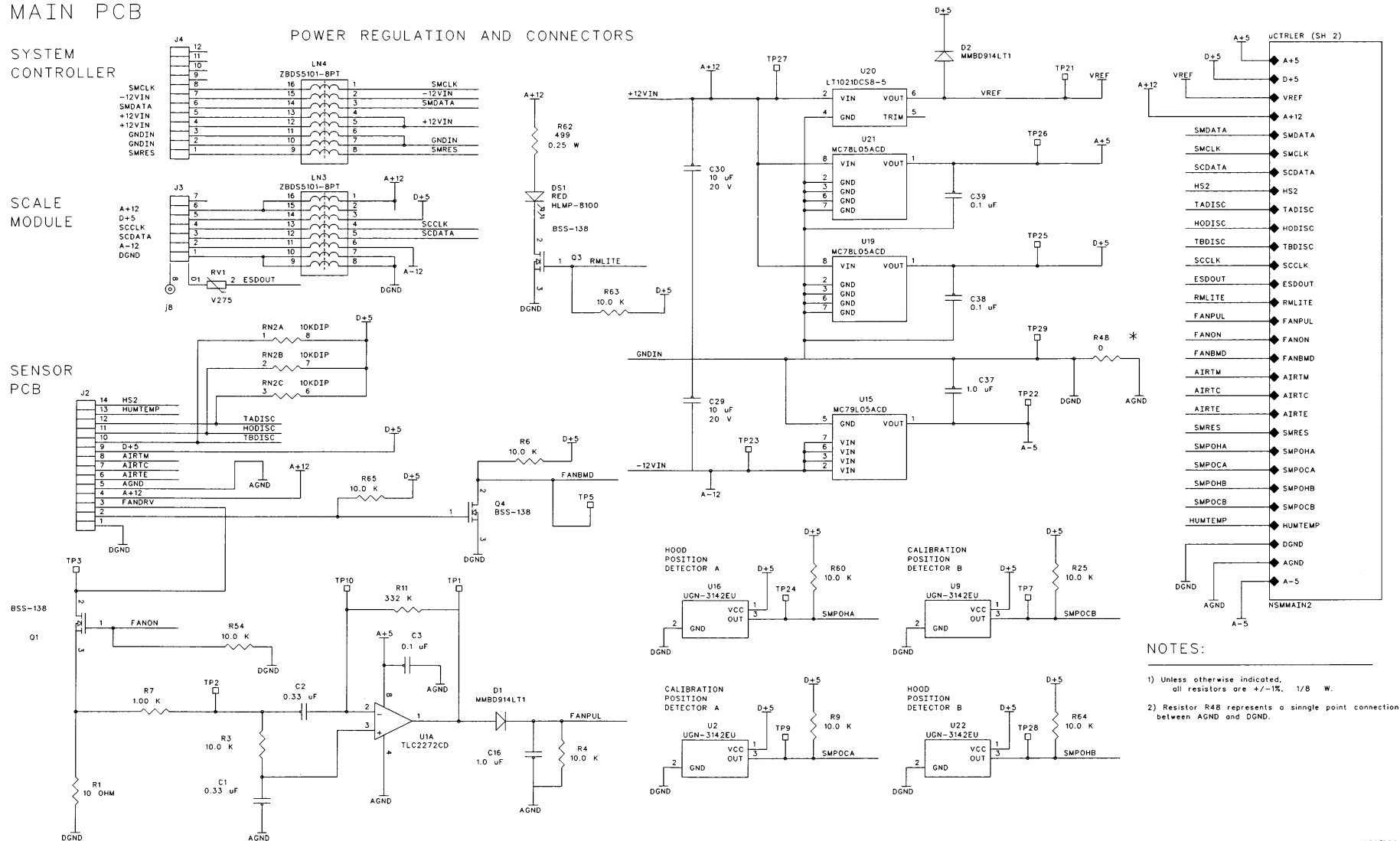
MAIN PCB

SYSTEM CONTROLLER

SCALE MODULE

SENSOR PCB

POWER REGULATION AND CONNECTORS



NOTES:

- 1) Unless otherwise indicated, all resistors are +/-1%, 1/8 W.
- 2) Resistor R48 represents a single point connection between AGND and DGND.

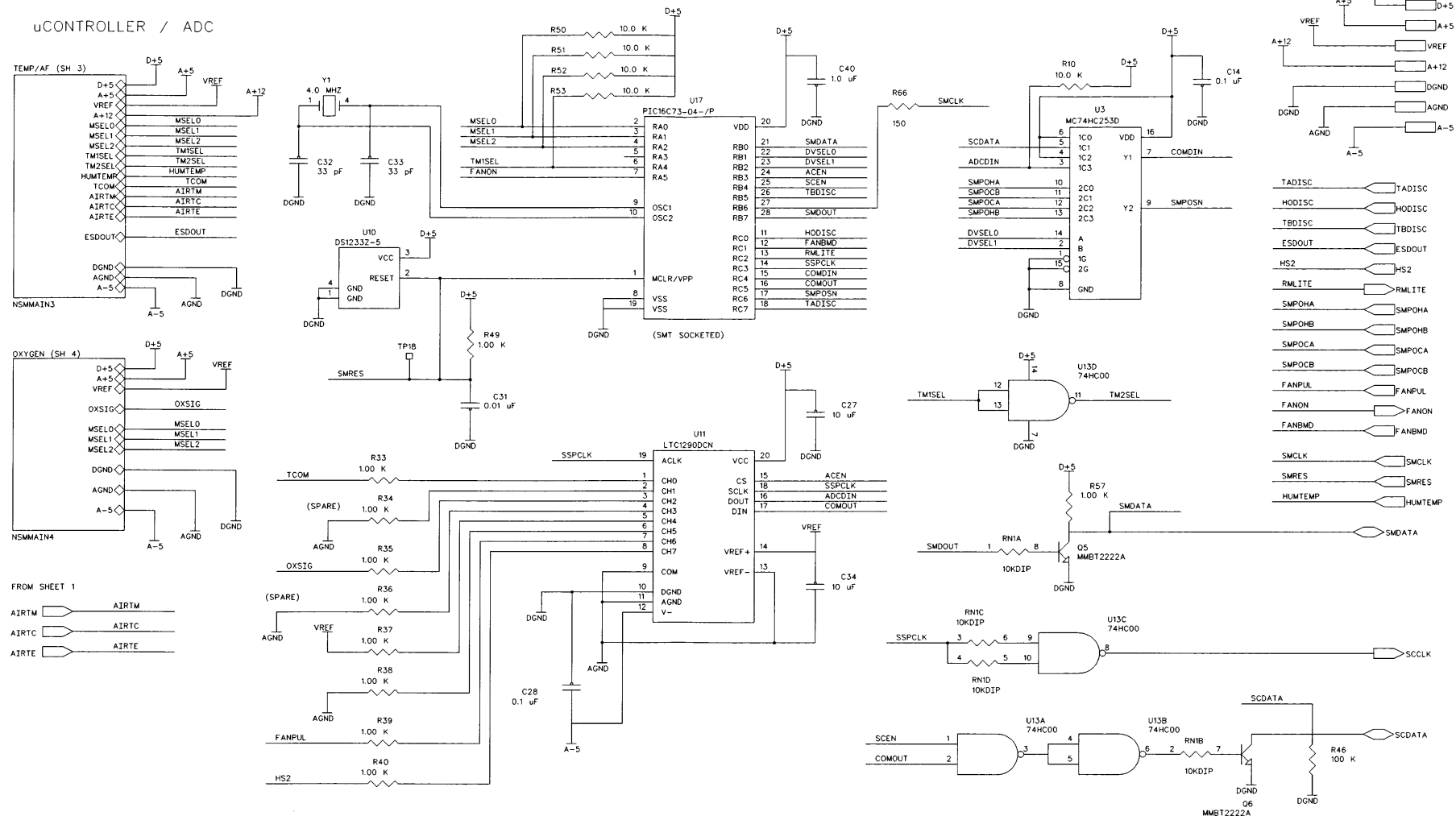
m223f023

FO 3-5.1

Sensor Module P.C. Board Schematic Diagram (Sheet 2 of 4)

MAIN PCB

uCONTROLLER / ADC



NOTES:

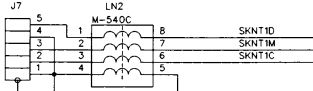
1) Unless otherwise indicated, all resistors are $\pm 1\%$, 1/8W.

Sensor Module P.C. Board Schematic Diagram (Sheet 3 of 4)

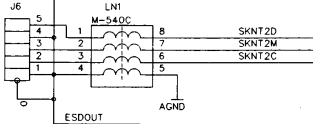
MAIN PCB

TEMPERATURE MEASUREMENT

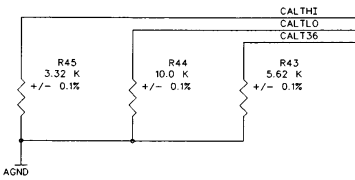
SKIN
TEMP
PROBE1



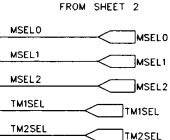
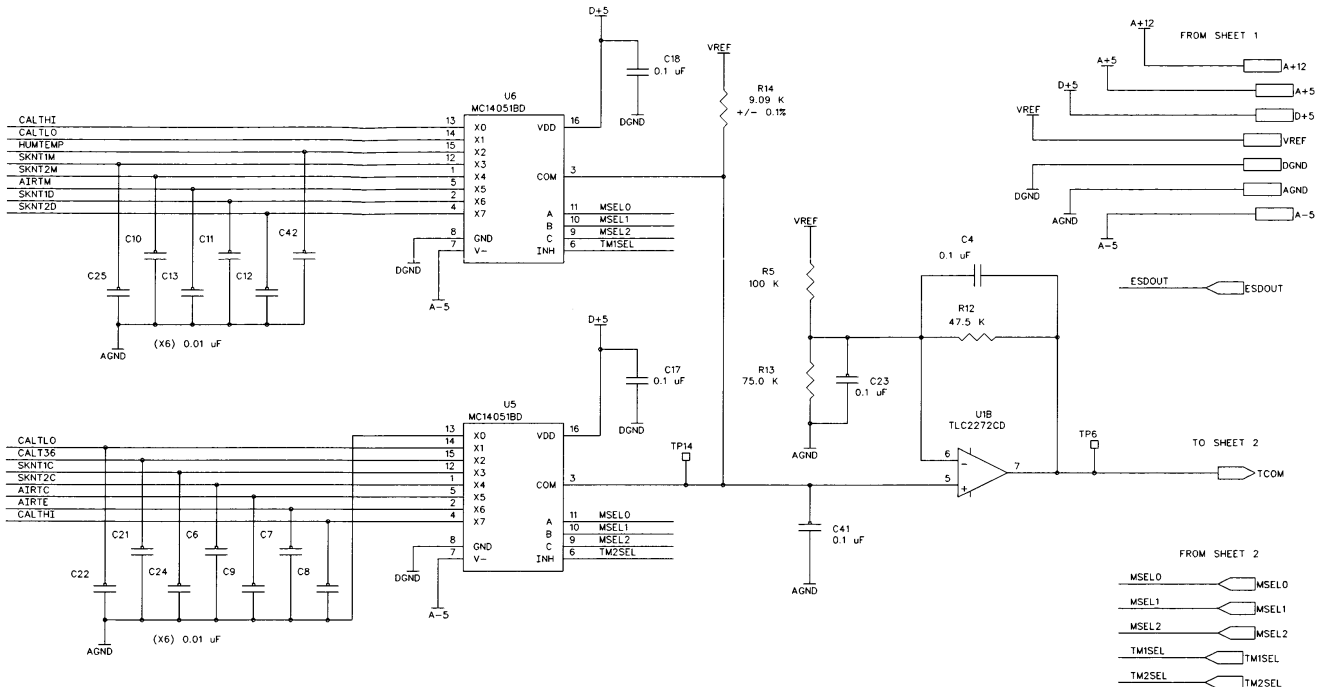
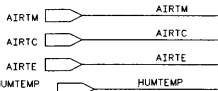
SKIN
TEMP
PROBE2



TEMP
CAL



FROM SHEET 2



NOTES:

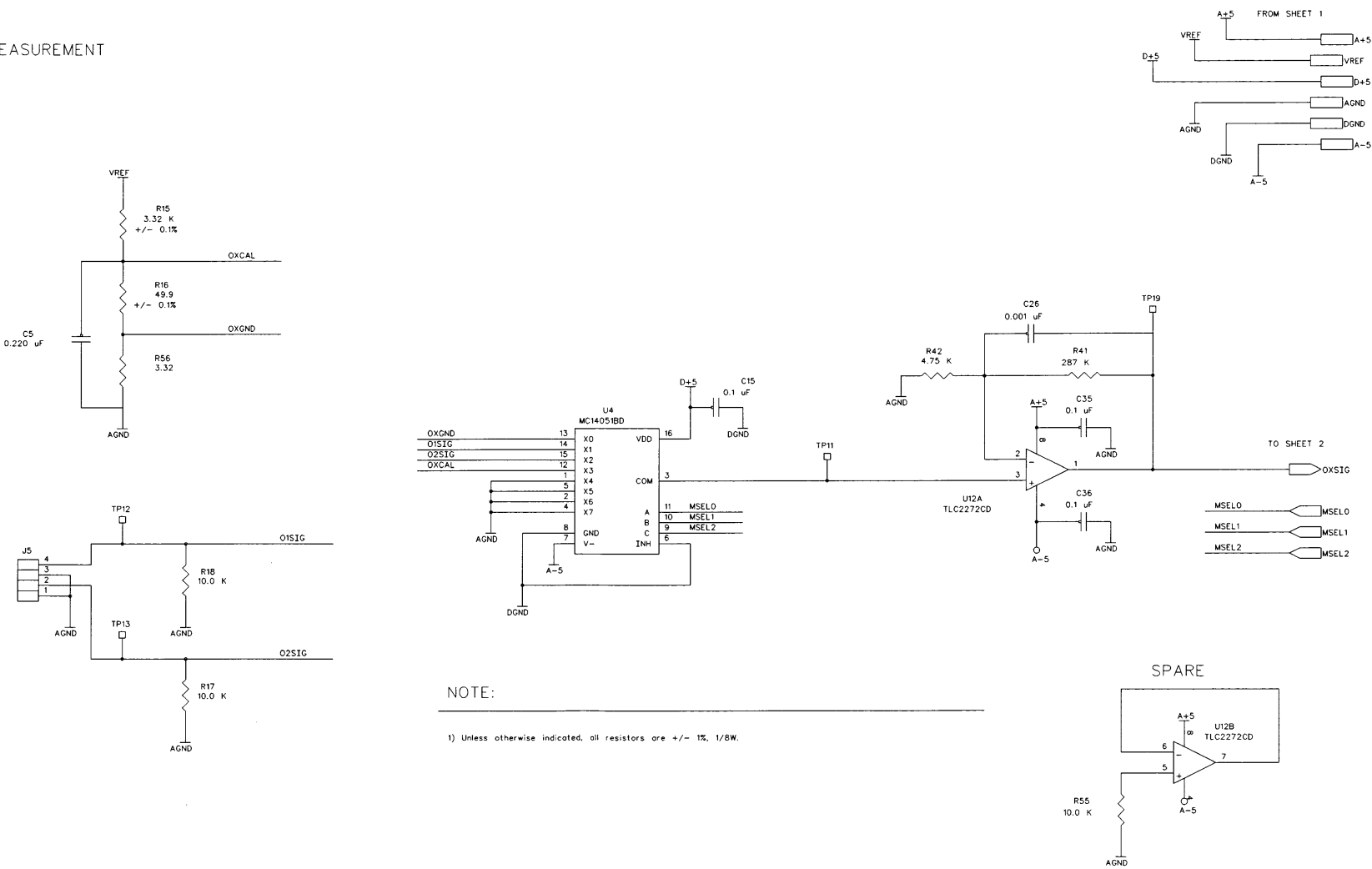
1) ALL RESISTORS +/- 1%, 1/8 W UNLESS OTHERWISE INDICATED.

Sensor Module P.C. Board Schematic Diagram (Sheet 4 of 4)

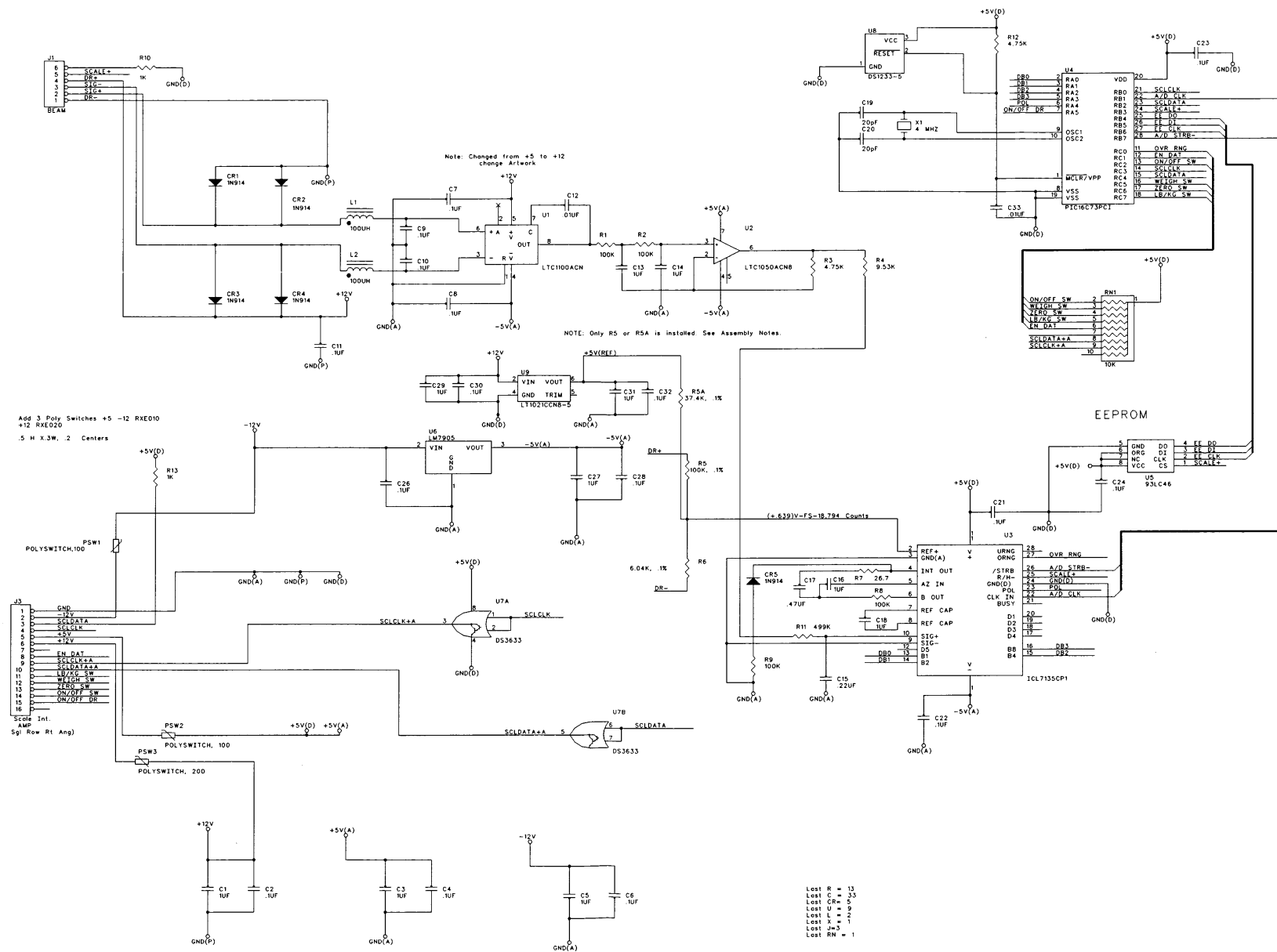
MAIN PCB

- OXYGEN MEASUREMENT

OXYGEN
SENSORS



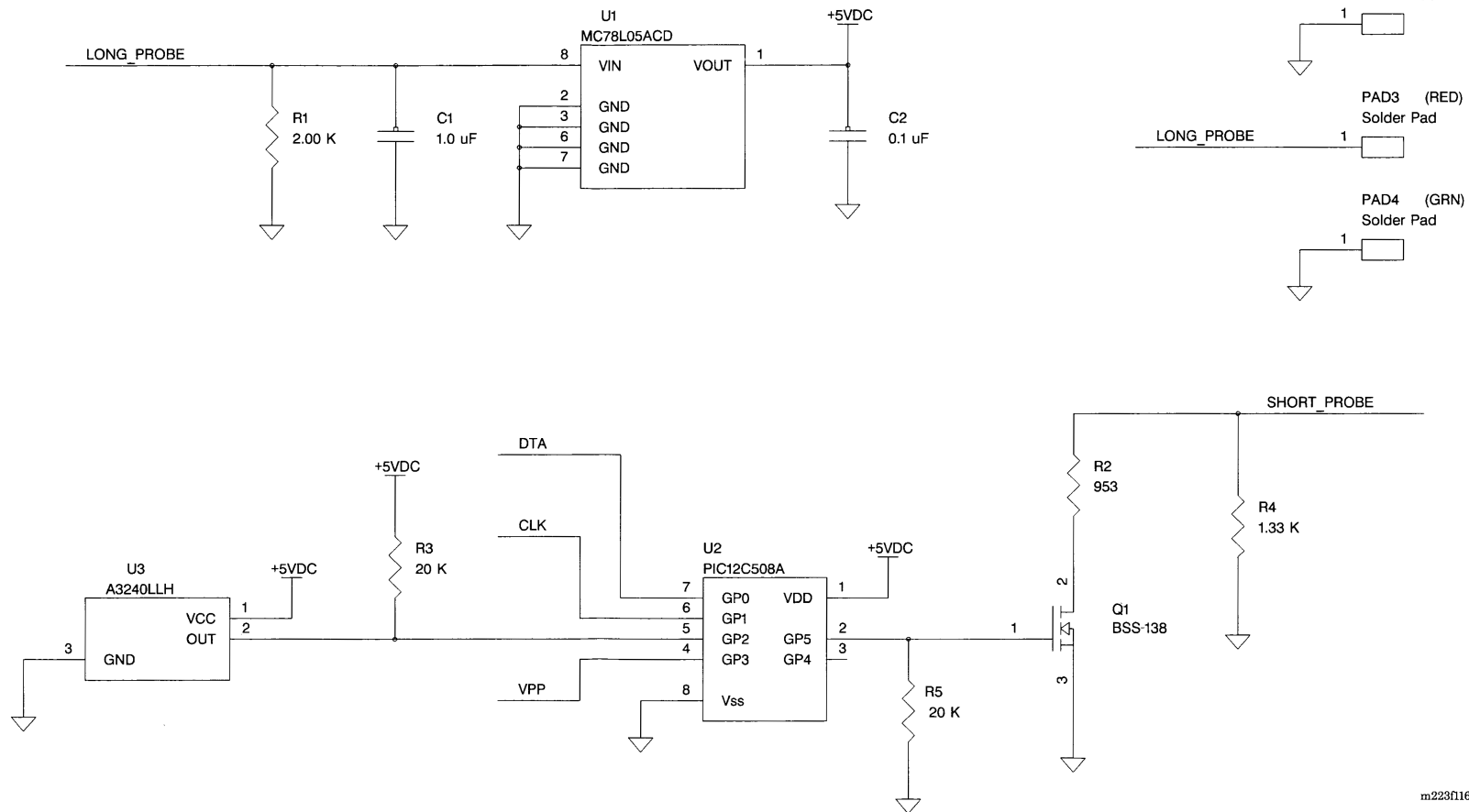
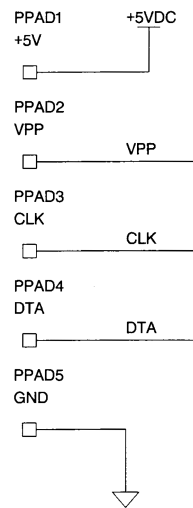
Scale P.C. Board Schematic Diagram



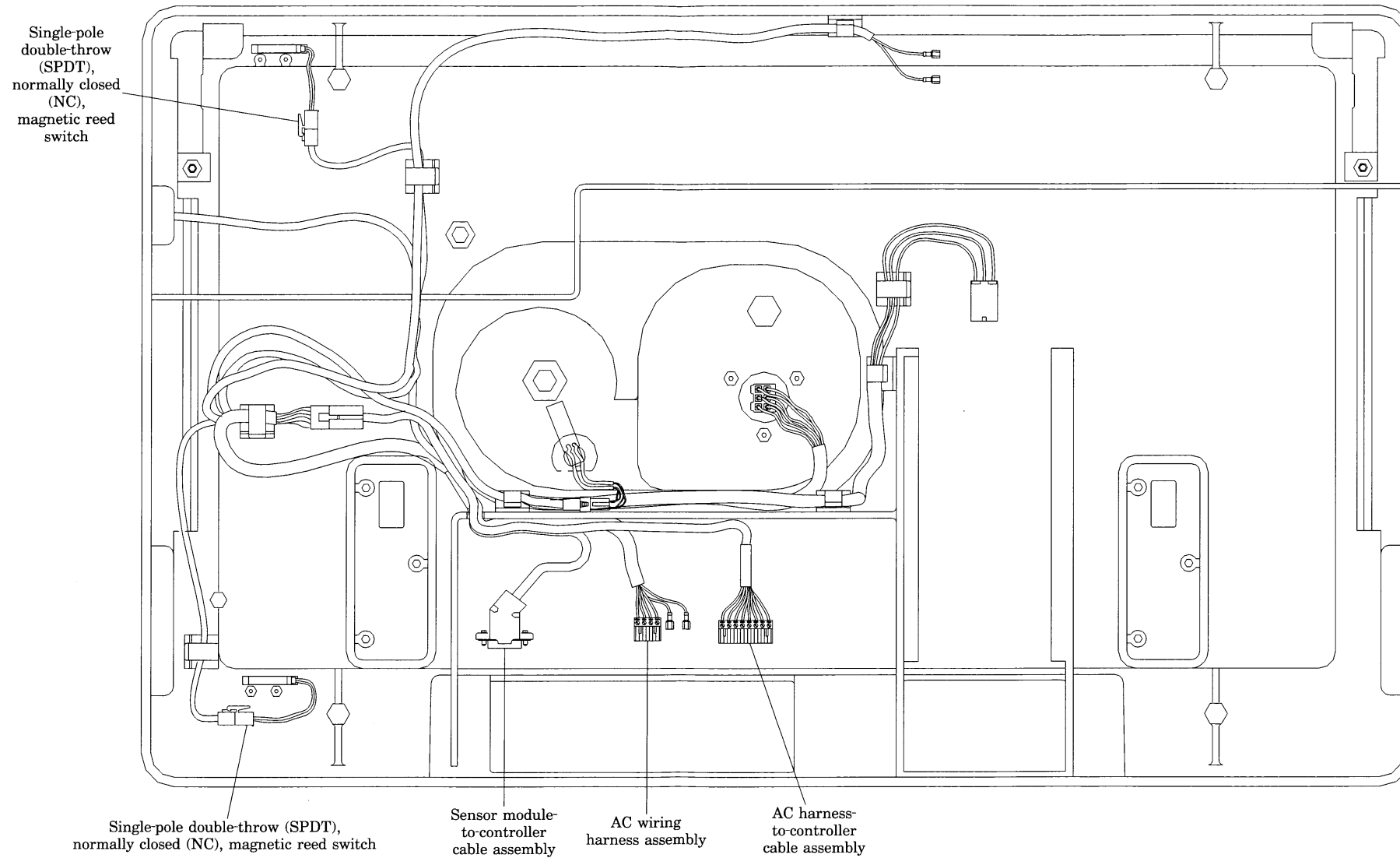
Impeller Movement Detector P.C. Board Schematic Diagram

System
Connections

In-Circuit
Programming
Pads



Shell Assembly Cable Routing



m223g191

FO 3-8

Scale Assembly Cable Routing

